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This thesis examines design as a methodology for applying critical and creative thinking to further an understanding from a systems perspective of interdependent variables seeking an internal and external equilibrium to support decisions based on an assessment of capability and ability within the Joint Operation Planning Process (JOPP). The process of design brings clarity, defines the critical challenges, and builds an analytical bridge between the problem and action. Design is essential, but misunderstood and what went wrong in the application of design into military doctrine can be distilled into four major points:

1. Lack of clarity of where design fits.
2. Confusion of design with commander's intent and guidance.
3. Mixing of design and mission analysis.
4. Profusion of terms to replace original design precepts.

In order to get design back on track, doctrine must: define the relationship between design and its linkages in a hierarchical planning structure favored by military services; define where and how design fits in the JOPP and that design no longer remains as a separate and distinct process; and define where original design precepts and terms clearly reside.

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**JOINT ADVANCED WARFIGHTING SCHOOL**


# THE CONCEPT OF DESIGN: ARE WE OFF TRACK?

**by**

**Thomas B. Gukeisen**

***LTC, United States Army***

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A paper submitted to the Faculty of the Joint Advanced Warfighting School in partial satisfaction of the requirements of a Master of Science Degree in Joint Campaign Planning and Strategy. The contents of this paper reflect my own personal views and are not necessarily endorsed by the Joint Forces Staff College or the Department of Defense.

This paper is entirely my own work except as documented in footnotes.

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## ABSTRACT

This thesis examines design as a methodology for applying critical and creative thinking to further an understanding from a systems perspective of interdependent variables seeking an internal and external equilibrium to support decisions based on an assessment of capability and ability within the Joint Operation Planning Process (JOPP). The process of design brings clarity, defines the critical challenges, and builds an analytical bridge between the problem and action. Design is essential, but misunderstood and what went wrong in the application of design into military doctrine can be distilled into four major points:

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## ILLUSTRATIONS

Page

## TABLE OF CONTENTS

# CHAPTER 1: INTRODUCTION

Strategy is a method and a tool through which a state operating in a dynamic environment exerts its influence and advances or protects its interests in a self-organizing complex system. Within the military, the challenge is how to link the implementation of strategic goals to tactical actions. The operational level of war serves as the link between the function of military forces to achieve strategic outcomes and the innumerable tactical actions conducted with the purpose of achieving the objectives of a campaign.

In the business world, a similar problem existed. How are business strategic goals achieved by means of applying the proper resources within a certain environment? The Harvard Business School answer to this was the design school. Kenneth R. Andrews' book, *The Concept of Corporate Strategy* (1971) summarizes the essence of design as a business model, describing it as: "the intellectual process of ascertaining what a company might do in terms of environmental opportunity, of deciding what it can do in terms of ability and power, and of bringing these two considerations together in optimal equilibrium."[1] The school of design is further characterized by Henry Mintzberg as both opportunistic and dialectic in nature as it seeks new and emergent opportunities and is constantly analyzing the intersection of conflicting demands, constraints, and uncertainty.

The design school of strategy development is based on the understanding of interdependent variables seeking an internal and external equilibrium from a systems perspective. The terms, concepts, and intellectual accessories presented by Kenneth Andrews, Henry Mintzberg, Ludwig von Bertalanffy, Thomas Kuhn, Horst Rittel, Melvin Webber, Dietrich Dörner, and Peter Senge listed below cement a deeper appreciation and understanding

[1] Kenneth R. Andrews, *The Concept of Corporate Strategy* (IL: Homewood, 1971), 12.

of design as a methodology for applying critical and creative thinking to construct a framework in developing a systems approach to solve problems.

> 1. Requires an understanding of complex problems as non-linear systems. Observation, analysis of relationships, extrapolation of data, and the formation of a model, theory, or paradigm.
> 2. A critical and creative thinking process. Understanding situations, finding causes, arriving at justifiable conclusions, making good judgments, and learning from experience to solve problems. Using adaptive approaches, drawing from previous similar circumstances, or applying innovative approaches, to develop a completely new idea.
> 3. Learning organizations act as complex problem solvers. Personal mastery, mental models, shared vision, and team building.

Just as in the national strategic calculus, the business model seeks to understand the environment and apply resources in the proper mix to achieve the best outcomes. Design is a natural companion to the development of strategy, and to operational art, because it is a thinking construct that provides direction and understanding prior to implementation and application; it brings clarity, defines the critical challenges, and builds an analytical bridge between the problem and action. Design was intended to be an important part to assist in taking a mission statement and end state and translating it into a comprehensive operational plan that clearly articulates overall purpose and direction.[2] However, Joint doctrine and Army doctrine differed in the application of design. Joint doctrine combined thirteen elements (terms) of what was previously known as operational art into elements of operational design. Terms are often applied interchangeably and buried in multiple processes. Both saw design as an iterative process that only applied when faced with ill-structured problems further adding to confusion over where design fits into the planning process. Second, many of the products and intellectual explorations described in the design process were synonymous to mission analysis. The lack of a clear

[2] Keith D. Dickson, *Operational Design: A Methodology for Planners*, Student text Joint Advanced Warfighting School (Norfolk, VA, 15 February 2012), 1.

explanation of the linkages to the planning process additionally confused practitioners. Although the Army follows the design originators in describing the outcome of design, it provides no prescription for how these results are obtained. In contrast, Joint doctrine defines the interaction between operational art and operational design as a link between strategy and tactics thus nesting strategic aims to tactical operations through unified action. The incongruence and dissection of what went wrong in the application of design into military doctrine can be distilled into four major points:

1. Lack of clarity of where design fits.
2. Confusion of design with commander's intent and guidance.
3. Mixing of design and mission analysis.
4. Profusion of terms to replace original design precepts.

The initial step in getting design back on track is to properly define design as a methodology for applying critical and creative thinking to further an understanding from a systems perspective of interdependent variables seeking an internal and external equilibrium to support decisions based on an assessment of capability and ability. In order to get design back on track, doctrine must: define the relationship between design and its linkages in a hierarchical planning structure favored by military services; define where and how design fits in the Joint Operation Planning Process (JOPP) and that design no longer remains as a separate and distinct process; and defining where original design precepts and terms clearly reside.

## CHAPTER 2: FOUNDATIONS OF STRATEGY, OPERATIONS, AND DESIGN

> Like an old piece of gum, it has stuck, no matter how often the specialists warn against using it. Since we cannot get rid of it, we should make the best possible use of it.
>
> Robert M. Citino

Strategy [as applied to the military] is best understood as the art and science of developing and using the political, economic, socio-psychological, and military powers of the state in accordance with policy guidance to create effects that protect or advance the state's interests in the strategic environment.[1] Strategy is a method and a tool through which a state operating in a dynamic environment exerts its influence and advances or protects its interests in a self-organizing complex system. The strategic process results in choices that provide direction for the state to achieve its security interests either by means of coercion or by means of persuasion. In the domain of war, strategy encompasses the conduct of protracted level of conflict between nations, armed or unarmed. Strategy, as a function of statecraft, relies on eight underlying premises to achieve national security interests: it is proactive and anticipatory; it has a defined end state; it identifies an appropriate balance among the methods to pursue the objectives, and the resources available; it is dominated by political purpose; it is hierarchical in nature and comprehensive in its approach; it is developed from a thorough analysis and knowledge of the environment, and acknowledges that risk is inherent.[2]

To understand how strategy is applied in war, the importance of hierarchy and a comprehensive approach are critical. Hierarchy facilitates a span of control by defining

[1] Harry Yarger, "Strategic Appraisal: They Key to Effective Strategy" *The U.S. Army War College Guide to National Security Issues: Volume 1: Theory of War and Strategy*, (Pennsylvania: Strategic Studies Institute, July 2010), 53.

[2] Gregory D. Foster, "A Conceptual Foundation for a Theory of Strategy," *The Washington Quarterly*, Winter, 1990: 43.

responsibility and authority. More importantly, hierarchy provides a relationship between objectives, concepts, and resources. Thus, national military strategy should articulate military objectives and express the strategic concepts and resources that support those objectives in terms appropriate to the national level.[3] The comprehensive approach to strategy ensures integrating efforts of the senior, coequal, and subordinate elements of strategy. Harry Yarger focuses on the importance of a comprehensive approach to strategy. The capabilities and resources of one strategic level influence on the whole of the environment. Yarger adds that, "good strategy is never developed in isolation."[4] (See Figure 1.)

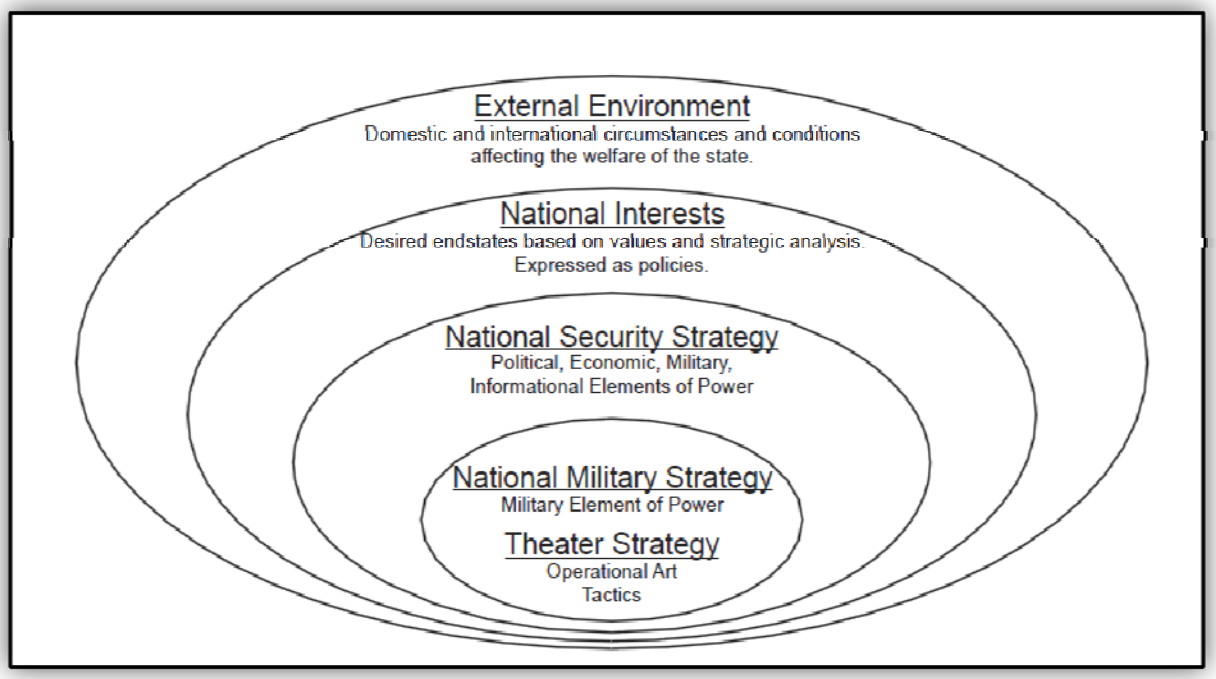


**Figure 1: Comprehensiveness of Strategy.**

**Source: Harry Yarger, "Toward a theory of Strategy: Art Lykke and the U.S. Army War College Strategy Model"** ***The U.S. Army War College Guide to National Security Issues: Volume 1: Theory of War and Strategy*****, (Pennsylvania: Strategic Studies Institute, July 2010), 48.**

[3] Harry Yarger, "Toward a Theory of Strategy: Art Lykke and the U.S. Army War College Strategy Model" *The U.S. Army War College Guide to National Security Issues: Volume 1: Theory of War and Strategy*, (Pennsylvania: Strategic Studies Institute, July 2010), 47.

[4] Ibid, 48.

Richard P. Rumelt describes a strategy as a coherent action backed by an argument, an effective mixture of thought and action with a basic underlying structure, which he refers to as a *kernel*.[5] This structure consists of a diagnosis, a guiding policy, and a set of coherent actions. The diagnosis defines or explains the nature of the challenge. It simplifies the situation and replaces the overwhelming complexity of reality with a simpler story and allows for further problem solving.[6] A guiding policy outlines an overall approach for overcoming the diagnosed problem. They are not goals, visions, or images of the desired end state rather they define the method, ruling out a vast array of possible actions; the policy should identify sources of advantage, anticipating the actions of others, reducing the complexity and ambiguity, and articulate the method by leverage. [7] Lastly, a strategy should have coherent actions that are coordinated with one another accomplishing the guiding policy.

In contrast to a good strategy, a bad strategy is not simply the absence of a good strategy. It is an identifiable way of thinking and writing a strategy that grows out of a specific misconception and leadership dysfunctions.[8] Rumelt defines four-hallmarks to identify a bad strategy: fluff, a form of gibberish masquerading as strategic concepts or arguments that uses inflated words and esoteric concepts to create the illusion of high-level of thinking; failure to face the challenge by not defining the problem; mistaking goals for strategy; and bad strategic objectives. [9]

[5] Richard P. Rumelt, Good Strategy Bad Strategy: The Difference and Why it Matters (New York: Crown Business, 2011), 77.

[6] Ibid, 81.

[7] Ibid, 84-87.

[8] Ibid, 32,36.

[9] Ibid, 32-57.

The strategic level differs from operational and tactical levels of war in both functional and temporal aspects. The operational level is the domain of the campaign, a series of battles occurring over a longer period of time which fulfills strategic intent. The tactical level of war is the domain of battles, engagements of relative short duration dictated by the campaign. Tactics concerns itself with the parts or pieces, operational art with the combination of the pieces, and strategy with the combinations of combinations.[10]

The need to perceive and identify an operational level of warfare arose during the late nineteenth century as armies moved more freely within a theater of operations and the field armies themselves grew to sizes beyond the ability of a single commander to direct. Technologies such as the telegraph and the railroad extended lines of communication and support, and weapons technology created greater lethality on the battlefield. These conditions created a gap between the strategic and tactical levels of command. The tactical level of command was insufficient to direct such a vast array of forces; nor was the strategic level the proper place for the field commander. This gap was filled by defining an operational level of war. The operational level of war serves as the link between the function of military forces to achieve strategic outcomes and the innumerable tactical actions conducted with the purpose of achieving the objectives of a campaign. Operations are complex military actions and battles linked by time, place, and intent. Battles might extend for several weeks or longer, but they remain linked within time, duration, support, scale, range, and distance.[11] The operational level of war, as it is understood today, is reflected in the operational art.[12] The concept of the

[10] Yarger, 47.

[11] Bruce W. Menning, "Operational Art's Origins," *Military Review* (September-October 1997): 35.

[12] For the purpose of this thesis, operational art is defined using the current Joint Doctrine as the cognitive approach by commanders and staffs that supported by their skill, knowledge, experience, creativity, and judgment to

operational art, first conceived by Soviet strategists in the 1920s, postulated the need for a process to link the strategic and operational level of war. Since the late 1980s, when the concept of operational art entered into American doctrine, the operational art has focused on the insight, intuition, knowledge, experience, and skill of the practitioner to link strategic intent with the campaign planning. Operational art is the "creative use of distributed operations for the purpose of strategy that are characterized by an ensemble of deep maneuvers and distributed battles extended in space and time integrated in a campaign unified by a common aim in retention or denial of freedom of action punctuated by a period of inaction."[13]

In the business world, a similar problem existed. How are business strategic goals achieved by means of applying the proper resources within a certain environment? The Harvard Business School answer to this was the design school. The design school has generally been associated with the Business Policy Group at Harvard Business School, which came to the forefront with Kenneth R. Andrews' book, *The Concept of Corporate Strategy* (1971). It is the primary scholarly source of the design school as a business model. Andrews summarizes the essence of design as a business model, describing it as: "the intellectual process of ascertaining what a company might do in terms of environmental opportunity, of deciding what it can do in terms of ability and power, and of bringing these two considerations together in optimal equilibrium."[14] Just as in the national strategic calculus, the business model seeks to understand the environment and apply resources in the proper mix to achieve the best outcomes.

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develop strategies, campaigns, and operations and organize and employ military forces by integrating ends, ways, and means.

[13] See discussion in Schneider, *Vulcan's Anvil: The American Civil War and the Foundation of Operational Art Theoretical Paper No. Four*, (Fort Leavenworth: United States Army Command and General Staff College, 10 May 2004), 16-21, 34.

[14] Kenneth R. Andrews, *The Concept of Corporate Strategy* (IL: Homewood, 1971), 12.

Andrews characterized the design school as synthetic, abductive, hypothesis-driven, opportunistic, dialectic, and value-driven.[15] It is abductive in nature by focusing on what is possible, rather than what is provable and driven by hypothesis. The model relies heavily on both external and internal situation awareness to uncover threats and opportunities. This awareness also reveals strengths and weaknesses that, when combined with the social values and social responsibilities of an organization and its management, leads to a creation of a strategy.[16]

The school of design is further characterized by Henry Mintzberg as both opportunistic and dialectic in nature as it seeks new and emergent opportunities and is constantly analyzing the intersection of conflicting demands, constraints, and uncertainty. Finally, because it is value-driven, the strategy is discovered rather than invented and is always open to scrutiny and cognizant of the values embedded within the evaluation and choice of strategy. Andrews' concepts are summarized by Mintzberg in Figure 2. Mintzberg's model clearly illustrates the interaction of the internal and external appraisals during the creation of the strategy, and how they return during the evaluation and choice of strategy.

[15] Jeanne M. Leidtka, "Strategy Formulation: The Roles of Conversation and Design", *The Blackwell Handbook of Strategic Management* (UK: Blackwell Publishing, 2005), 87-89.

[16] These concepts are best known as the SWOT (Strength Weakness Opportunity and Threats) analysis created by Albert Humphrey from which Andrews adds in the importance of internal and external values or the social responsibility of a business and its managers.

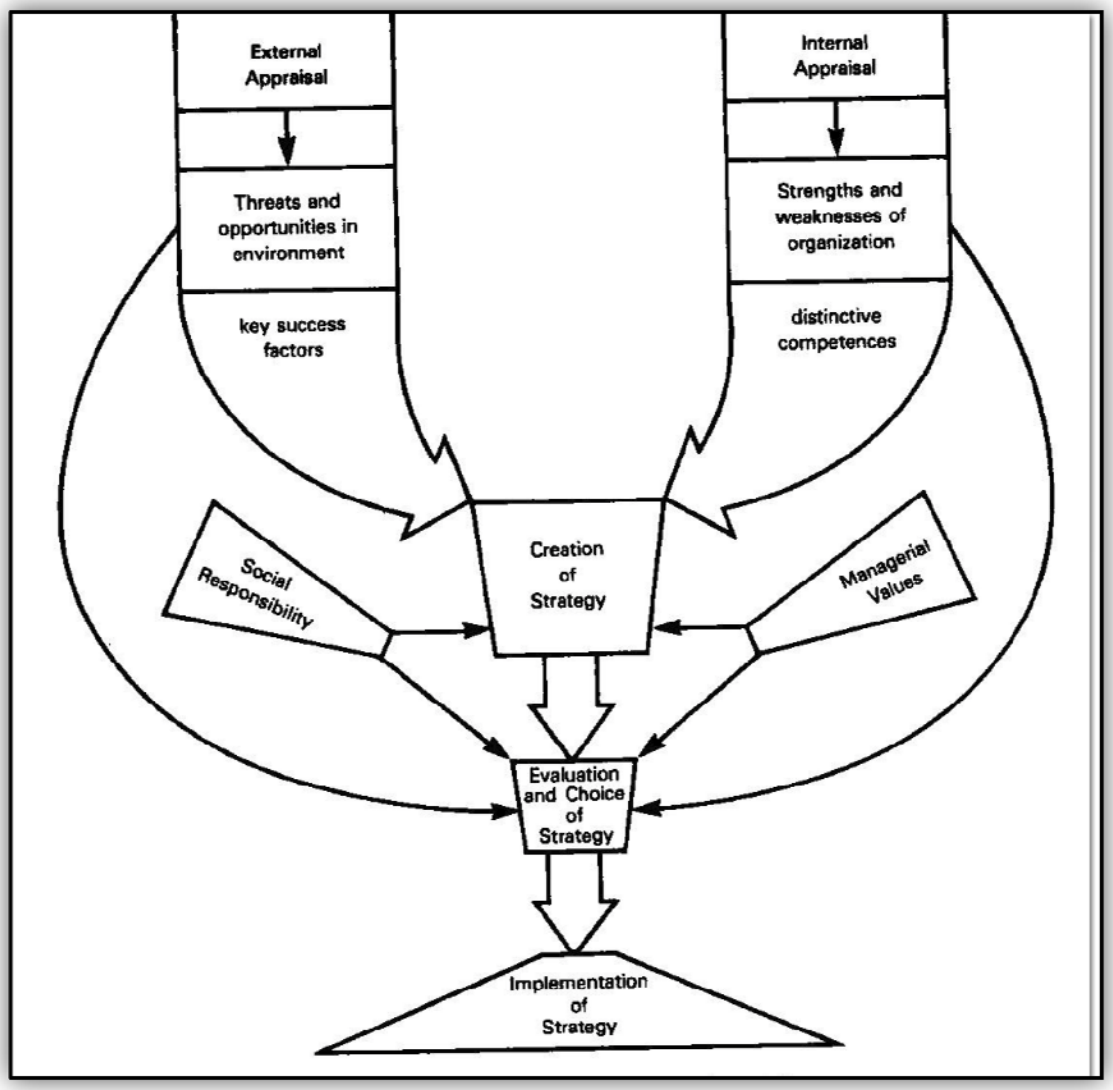


**Figure 2: Core Design School Model for Strategy Formulation**

**Source: Henry Mintzberg, "The Design School: reconsidering the Basic Premises of Strategic Management", *Strategic Management Journal, Vol. 11, No. 3* (UK: John Wiley & Sons, 1990), 174.**

In comparison of the two models of strategy, Mintzberg's business model of strategy has a greater appreciation for the complexity and variables than national strategy formulation by Yarger and Foster, which are based on structure and hierarchy.

The concept of design makes a clear distinction between thinking and the implementation of action. Until we know the problem and the approach, we cannot begin to specify the

interrelated components that are required for implementation. Mintzberg summarized the school of design premises in the following list of characteristics:[17]

1. Controlled and conscious process of thought.
2. Simple and informal models.
3. One strategist.
4. Unique.
5. Emerge fully formulated, explicit, and articulated.
6. Structure follows strategy.

Design should be a controlled, conscious process of thought. "Action must flow from reason: effective strategies derive from a tightly controlled process of human thinking."[18] Andrews further explores this premise by declaring that strategies should be developed in a deliberate process that is formally learned.[19] One way to ensure that strategy can be controlled is to keep the process/model simple and informal.[20] The design model seeks an internal and external equilibrium by understanding the interdependencies from a systems perspective and visualizes the entire problem as one entity with multiple interrelationships. This involves creating a mental model of the complete system from end-to-end and developing a solution by creatively realigning interdependencies. The third premise refers to having only one strategist as the command and control entity.[21] It is the leader, the commander, the one who sits at the apex of the organizational hierarchy who "is principally concerned with determining and monitoring the adequacy of strategy, with adapting the firm to changes in its environment, and with securing and developing the people needed to carry out the strategy or to help with its constructive

[17] Henry Mintzberg, "The Design School: Reconsidering the Basic Premises of Strategic Management", *Strategic Management Journal, Vol. 11, No. 3* (UK: John Wiley & Sons, 1990), 177-179.

[18] Henry Mintzberg, Strategy Safari: The Guided Tour Through The Wilds of Strategic Management, (New York: Free Press, 1998), 29.

[19] Andrews, 24.

[20] Mintzberg, "The Design School: Reconsidering the Basic Premises of Strategic Management", 177.

[21] Robert H. Hayes, "Strategic Planning – Forward in Reverse?" in *Harvard Business Review, November-December 1985* (Boston: Harvard Business School, 1985), 117.

revision or evolution."[22] Andrews described this person as the "architect of organizational purpose" that must rely on insight and imagination to solve the problem and rely on logic and reason to determine which solution should be formulated and implemented.[23] The fourth premise states that the strategy should be one of a kind, unique. Both Mintzberg and Andrews agree that the best strategies result from a process of individualized design and built on creativity and on "situational philosophy." [24] In the fifth premise, a strategy emerges from the design process fully formulated, explicit, and articulated. Formulation comes to an end with the delineation and choice of a particular strategy. [25] That strategy appears as a perspective; at some point in time, as a grand conception, the ultimate choice.[26] This strategy should be explicit for those that make them and articulated so that others in the organization can understand them. Hence, "Simplicity is the essence of good art and conception of strategy brings simplicity to complex organizations."[27] Strategy brings clarity, defines the critical challenges, and builds a bridge between the problem and action. Finally, Mintzberg states in his sixth premise that only after a unique, full blown, explicit, and simple strategy is fully formulated can it then be implemented.[28] The design school separates the thinking or strategy development from action. Central to this distinction is that another structure must follow the strategy in which Andrews explains as, "Until we know the strategy we cannot begin to specify the appropriate structure."[29] The

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[22] Mintzberg, "The Design School: Reconsidering the Basic Premises of Strategic Management", 176.

[23] Andrews, 3.

[24] C.R. Christensen, K.R. Andrews, J.L. Bower, G. Hammermesh, M.E. Porter, *Business Policy: Text and Cases*, 5th Edition(IL: Irwin, 1982), 186. and Henry Mintzberg, *Strategy Safari: The Guided Tour Through The Wilds of Strategic Management*, (New York: Free Press, 1998), 33 and Henry Mintzberg, *The Rise and Fall of Strategic Planning* (New York: Simon & Shuster, 1994), 38.

[25] Henry Mintzberg, *The Rise and Fall of Strategic Planning* (New York: Simon & Shuster, 1994), 39.

[26] Mintzberg, Strategy Safari: The Guided Tour Through The Wilds of Strategic Management, 32.

[27] Christensen, Andrews, Bower, Hammermesh, Porter, *Business Policy: Text and Cases*, 554.

[28] Mintzberg, Strategy Safari: The Guided Tour Through The Wilds of Strategic Management, 32.

structure that follows a strategy is more abductive in its reasoning and is reflective of plan development. Planning is a formalized procedure to produce an articulated result, in the form of an integrated system of decisions.[30]

While national strategy is a method of changing an environment favorable to a desired outcome by means of coercion or persuasion, the process of applying strategy in a business model is expressed through the concept of design, expressed in its original form as an approach that is more participative, more dialogue-based, and less dogmatic than typical decision making processes. The design school of strategy development is based on the understanding of interdependent variables seeking internal and external equilibrium from a systems perspective.

Design is a natural companion to the development of strategy, and to operational art, because it is a thinking construct that provides direction and understanding prior to implementation and application. The six precepts of the design school are summarized in figure 3.

[29] Christensen, Andrews, Bower, Hammermesh, Porter, *Business Policy: Text and Cases*, 551.

[30] Mintzberg, The Rise and Fall of Strategic Planning, 12.

| Precepts for using design as a method for strategy development |
|---|
| 1. A Controlled, conscious process of thought. Developed in a deliberate process that is formally learned. |
| 2. Process/model is kept simple and informal. Creating a mental model of the complete system from end-to-end as one entity with multiple interrelationships and developing a solution by creatively realigning interdependencies toward equilibrium. |
| 3. Responsibility rests with the leader of the organization as the one strategist. |
| 4. The strategy should be one of a kind, unique, that results from a process of individualized design and built on creativity. |
| 5. Strategy emerges from the design process fully formulated, explicit, and articulated. It brings clarity, defines the critical challenges, and builds a bridge between the problem and action. |
| 6. Another structure must follow the strategy and is reflective of plan development. |

**Figure 3: School of Design Precepts.**

**Source: Created by author to summarize Henry Mintzberg Design Premises found in: "The Design School: reconsidering the Basic Premises of Strategic Management"; *The Rise and Fall of Strategic Planning; Strategy Safari: The Guided Tour Through The Wilds of Strategic Management.***

## CHAPTER 3: INTELLECTUAL ACCESSORIES OF DESIGN

> Some problems are so complex that you have to be highly intelligent and well informed just to be undecided about them.
>
> Laurence J. Peter

The design school of strategy development is based on the understanding of interdependent variables seeking an internal and external equilibrium from a systems perspective. The terms, concepts, and intellectual accessories presented in this chapter cement a deeper appreciation and understanding of design as a methodology for applying critical and creative thinking to construct a framework in developing a systems approach to solve problems.

### Understanding A Problem

A problem is defined as an obstacle, impediment, difficulty, challenge, or any situation that invites resolution. The resolution of a problem is recognized as a solution or contribution toward a known purpose or goal.[1] In abroad sense, a problem exists when an individual or organization becomes aware of a significant difference between what actually is and what is desired. According to Russell Ackoff, within a problem there are five components:[2]

1. Decision maker. The one(s) faced with the problem.
2. Controllable variables. The aspects of the problem situation the decision maker can control.
3. Uncontrollable variables. Those aspects of the problem or situation the decision maker cannot control but those which, together with the controlled variables, can affect the outcome of his choice.
4. Constraints. The limitations imposed from within or without on the possible values of the controlled and uncontrolled variables.
5. Possible outcome. Produced jointly by the decision maker's options and the uncontrolled variables.

[1] Tim Hobbes, *The Anatomy of Problem Solving* (Colorado Springs, CO: Book Surge LLC, 2007), 9.

[2] Russell L. Ackoff, *The Art of Problem Solving* (Pennsylvania: John Wiley & Sons, 1978), 11-12.

The degree of interactive complexity of the five components determines the problem's structure. There are three types of problem structures: well-structured, medium-structured and ill-structured. In well-structured problems, all five components are easy to identify; constraints and variables are limited, and the outcome is fairly obvious. The nature of the well-structured problem is clear and the solutions are verifiable. Problems of mathematics and time and space relationships illustrate well-structured problems. Medium-structured problems are more interactively complex than well-structured problems, but like well-structured problems, the nature of the problem itself is clear. Decision makers can agree on the problem and the controllable variables (structure), but are uncertain how the uncontrollable variables and constraints will influence the outcome. An infantry battalion conducting a defense is an example of a medium-structured problem. Ill-structured problems are complex, nonlinear, and dynamic and are therefore the most challenging to solve. Unlike well or medium-structured problems, the decision maker has no clear path. The variables and constraints are unknown or hidden because the nature of the problem itself is not clear. A manifestation of diseases is an example of an ill-structured problem.

With so many controllable and uncontrollable variables in an ill-structured problem, every solution is unique and novel and will be custom designed based on the decision maker's degree of tolerance variance. Every solution attempt is expensive to implement and has lasting unintended consequences, some of which are likely to spawn completely new ill-structured problems.[3] Thus the decision maker often must rely on insight and imagination to solve the problem and rely on logic and reason to determine which solution should be formulated and implemented. Horst Rittel and Melvin Webber in 1973 described ill-structured problems as

[3] Jeff Conklin, Dialogue Mapping: Building Shared Understanding of Wicked Problems (England: John Wiley & Sons, LTD, 2006), 11.

"wicked problems." Wicked problems require understanding the problem through content while recognizing that a solution may not exist. They conclude that the possible outcomes may simply be variances in the degrees of better or worse. [4]

Ill-structured, (or wicked), problems are complex, nonlinear, and dynamic and are therefore the most challenging to solve and have to be tailored to the individual case. Unlike well or medium-structured problems, the decision maker has no clear path. The variables and constraints are unknown or hidden because the nature of the problem itself is not clear. Understanding the links within a system, allows assessments to determine where the roots of certain deficiencies lie. This understanding allows the goals to be defined more adequately. A complex system is in constant flux, with variables dynamically interacting with each other over time and causing the system to react in ways that may be, what Dietrich Dörner, Professor of Psychology at The University of Bamberg Germany, describes as, "in-transparent." To regulate a system like this, these variables must be clarified in such a way in order to classify them as general behaviors. The requirement to change a system requires an input into the system from the environment or by an output from another system into the environment by understanding the relationships of these general behaviors.

[4] Horst Rittel and Melvin Webber, "Dilemmas in a General Theory of Planning", *Policy Sciences 4* (Amsterdam: Elsevier Scientific Publishing Company, 1973) 155-169.

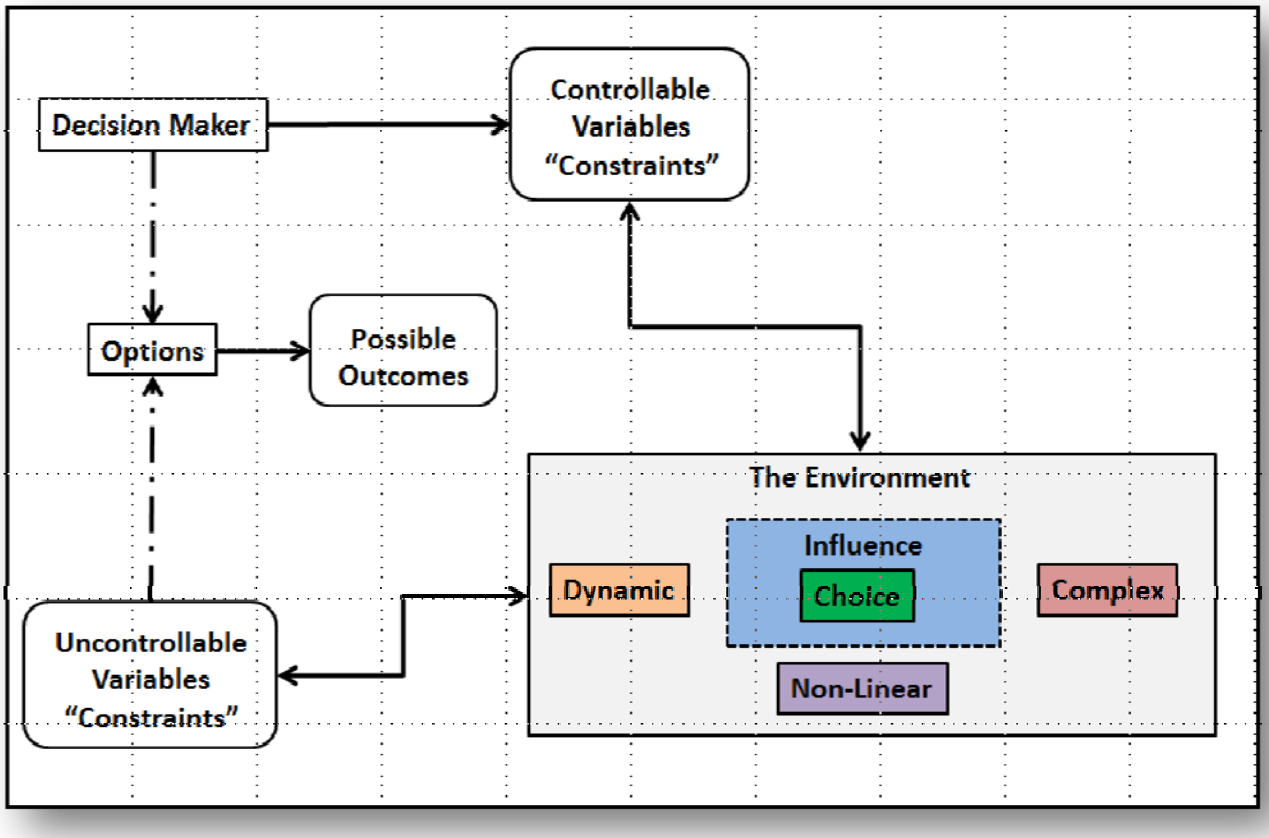


**Figure 4: Ill- Structured Problems.**

***Source:*** **Created by Keith Dickson and adapted by author to illustrate Russell Ackoff five components of a problem and Horst Rittel and Melvin Webber's description of ill-structured problems. Russell L. Ackoff, *The Art of Problem Solving* (Pennsylvania: John Wiley & Sons, 1978), 11-12 and Horst Rittel and Melvin Webber, "Dilemmas in a General Theory of Planning", *Policy Sciences 4* (Amsterdam: Elsevier Scientific Publishing Company, 1973) 155-169.**

## Problems Within Complex Systems

General Systems Theory (GST) was first conceived by Ludwig von Bertalanffy in 1928 to disprove the Descartian scientific method that a system could be broken down into individual components, analyzed, and added to (or subtracted from) in a predictable, linear fashion. He proposed that a system is characterized by the nonlinear interaction of its components. "We are forced," he wrote, "to deal with systems in all field of knowledge."[5] Thomas Kuhn expanded on Bertalanffy's theory in his book *The Structure of a Scientific Revolution* (1962) by defining a system as any relationship of two or more elements that are related in a sufficiently regular way to justify attention. Perhaps the greatest contribution Kuhn has to design is his inquiry into the disciplinary matrix. This disciplinary matrix includes an intellectual framework or set of shared concepts, assumptions, and background knowledge providing a context for interpreting observations, and building a theory or paradigm. [6]

Like Bertalanffy, Kuhn argued that science does not progress in a linear fashion, but Kuhn described linearity in terms of systems shifting in periodic revolutions or paradigms that move toward an equilibrium. These paradigms follow two general approaches: a cross-sectional approach, which deals with the interaction between two systems; and a developmental approach, which deals with the changes in a system over time.[7]

Changing a system requires an input into the system from the environment or by an output from another system into the environment. Kuhn described the agents that change the system as a detector, a selector, or an effector. The detector is the communication and interactive

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[5] Ludwig von Bertalanffy, *General Systems Theory: Foundations, Development, Application,* Rev. ed. (New York: George Braziller, 1993), 5.

[6] Thomas .S. Kuhn, *The Structure of Scientific Revolutions,* 3rd ed. (Chicago: University of Chicago Press, 1996), 182-186.

[7] Kuhn, 170.

agent of the system. A selector is governed by the fixed set of rules in which the system operates and compares that state with the goal state in the system and selects an appropriate response. The effector receives instructions from the selector to initiate a change by either communication, exchange of information, or transaction (the exchange of physical matter or energy) to reach equilibrium.[8]

Dietrich Dörner defines complexity as "the label we will give to the existence of many interdependent variables in a given system."[9] A complex system is in constant flux, with variables dynamically interacting with each other over time and causing the system to react in ways that may be "in-transparent," or not yet visible. This interaction similar to Kuhn's concept of agents initiating or creating change is regulated by feedback loops, some positive and some negative, as well as by critical and indicator variables. The causal relationships among the feedback loops and variables define the system, but not their interaction. To regulate a system like this, these tendencies must be clarified in such a way in order to classify them as general behaviors before buffering can occur. Buffering is the act of regulating or altering feedback loops and variables to prevent system failure. System failure normally results from over-or-under buffering a particular situation without regard to causal behaviors. In Dörner's observation, "we regulate the situation and not the process, steering it beyond the desired mark."[10] The key to complex systems management is the understanding of causal relationships, their linkages and their roots, and then classifying these relationships either as general behavior or a rare occurrence. Understanding the links within a system allows assessments to determine where the

[8] Kuhn, 46.

[9] Dietrich Dörner, *The Logic of Failure* (New York: Metropolitan Books, 1996), 38.

[10] Ibid, 30.

roots of certain deficiencies lie. This understanding allows goals to be defined more adequately.[11]

Goal setting is the first action in a five-step process that Dörner uses to organize a complex problem process. The purpose of goal setting is to clarify the outcome desired to facilitate the development of guidelines and criteria for assessment. By developing a model and gathering information, the second action, a cohesive picture or model is constructed on the basis of available information that aids in determining what is important and what is unimportant. This kind of "structural knowledge" brings order out of apparent chaos.[12] The prediction, extrapolation, and assessment step evaluates the model against the status quo and develops general behaviors over the course of time. After developing a structural model and extrapolating general behaviors, the next step is to consider measures to achieve the goal. These measures are the division that exists between what has been done in the past and a new unrecognized approach. Dörner warns that it is too easy to apply ritualistic pre-established patterns or "methodism." To be successful, it is necessary to know when to follow established practice and when to strike out in a new direction. Dörner makes the point that once the situation within the system is understood, then a strategy can be formulated to meet the set of goals. Dörner also emphasis that the strategy or approach must be revisited often to ensure that the system is being buffered properly toward the desired goal and depending on the reaction of the system, the strategy or approach must be modified to some degree, or in the worst case, abandoned.

[11] Ibid, 75-76.

[12] Ibid, 45.

Bertalanffy, Kuhn, and Dörner all present systems as complex and non-linear (Figure 5). Understanding systems requires observation, analysis of relationships, extrapolation of data, and the formation of a model, theory, or paradigm. Understanding systems, therefore, requires certain critical and creative thinking skills related to problem solving.

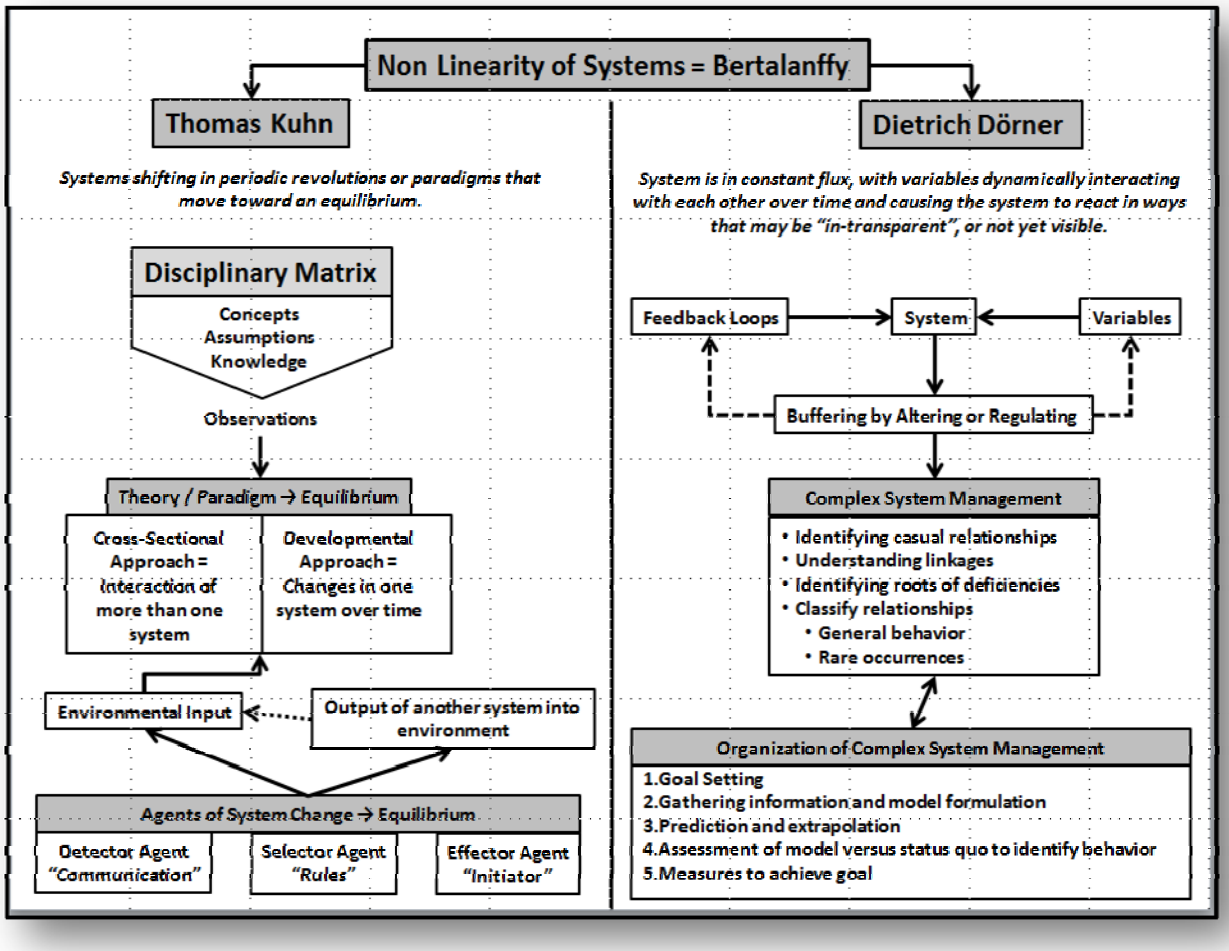


**Figure 5: Summation of Systems Theory.**

***Source:*** **Created by Keith Dickson and adapted by author from Ludwig von Bertalanffy, *General Systems Theory: Foundations, Development, Application,* Rev. ed. (New York: George Braziller, 1993); Thomas .S. Kuhn, *The Structure of Scientific Revolutions,* 3rd ed. (Chicago: University of Chicago Press, 1996); Dietrich Dörner, *The Logic of Failure* (New York: Metropolitan Books, 1996).**

## Problem Solving: Critical and Creative Thinking

The art of problem solving has been described as both an inability to understand problem solving and our ability to make decisions despite this deficiency. [13] Problem solving can take on many forms depending on organizational procedures. In general they all follow a basic decision making process which includes: identifying the problem, gathering information, developing possible solutions, analyzing and evaluating these solutions, selecting the optimal solution, then implementing and assessing the result.

Reason is a term that refers to the capacity of man to make sense of things, to establish and verify facts, and to change or justify practices, institutions, and beliefs.[14] Reason is the process of thinking, the cognition, and intellect to understand a system, its cause and effect, and the ability to discern what are good or bad methods: such as skipping steps, working backward, drawing diagrams, looking at examples, or seeing what happens if you change the rules of the system.[15] The way man reasons through this process is through logic.

Logic is applied inside a system of thought and is categorized into deductive reasoning, inductive reasoning, or abductive reasoning. Deductive reasoning draws its conclusion from a set of premises or hypotheses. If the premise or hypothesis is true then the conclusion is valid. The following is a classic example of deductive reasoning given by Socrates: Premise 1: All humans are mortal; Premise 2: Socrates is a human; Conclusion: Socrates is mortal. In contrast, inductive reasoning draws its conclusion from inference based on previous observations and experience. Conclusions have a high degree of probability, but the premise or hypothesis is not guaranteed, but rather ampliative. The following is a classic example of inductive reasoning by David Hume:

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[13] Ackoff, 13.

[14] Nikolas Kompridis, "So We Need Something Else For Reason to Mean", *International Journal of Philosophical Studies, Volume 8, Issue 3* (London: Taylor & Francis, December 2000), 271.

[15] Douglas Hofstadter, *Godel, Escher, Bach* (New York: Vintage Books, 1980),16.

Premise: The sun has risen in the east every morning up until now; Conclusion: The sun will also rise in the east tomorrow. Abductive reasoning determines the precondition, applies a rule, and then forms a conclusion. A common example is: Premise 1: When it rains the grass gets wet; Premise 2: The grass is wet; Conclusion: It has rained.

The most recognized form of inductive reasoning is critical reasoning often called critical thinking. Critical thinking involves logical thinking and reasoning including skills such as comparison, classification, sequencing, cause/effect, patterning, webbing, analogies, forecasting, planning, hypothesizing, and critiquing.[16] It means getting past the surface of the problem and thinking about it in depth, from several points of view instead of being satisfied with the first superficial assessment.[17] Critical reasoning is the key to understanding situations, finding causes, arriving at justifiable conclusions, making good judgments, and learning from experience to solve problems.

Another problem solving approach is called creative thinking. Creative thinking involves generating something new or original. It involves the skills of flexibility, originality, fluency, elaboration, brainstorming, modification, imagery, associative thinking, attribute listing, metaphorical thinking, and forced relationships. The aim of creative thinking is to stimulate curiosity and promote divergence.[18] Creative thinking includes using adaptive approaches, drawing from previous similar circumstances, or applying innovative approaches, to develop a completely new idea. The subconscious drawing from previous experiences, circumstances, and scenarios, is called conceptual blending. Conceptual blending requires a skill to control long

[16] Benjamin Bloom, Taxonomy of Educational Objectives: The Classification of Educational Goals; Handbook I: Cognitive Domain ( New York: Longman, 1956), 7.

[17] U.S. Army, *Army Leadership, Field Manual 22-100* (Washington DC: Department of the Army, 31 August, 1999), 4-19 to 4-21.

[18] Bloom, 8.

diffuse chains of logical reasoning simultaneously and grasp global meaning of such chains.[19] Individuals apply logic and reason, but organizations do as well. Complex systems often require thinking and learning organizations to understand them.

## Learning Organizations

The system theorist Peter Senge defines a learning organization as one "where people continually expand their capacity to create new results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to learn together."[20]

Central to this organization is the ability to dialogue as a team to learn how to recognize patterns of interaction within a system. A learning organization employs five systems or disciplines to assure innovative activity: systems thinking, personal mastery, mental models, shared vision, and team building. These disciplines are not mutually exclusive, but rather they work as an interactive and complimentary ensemble (Figure 6). Senge stresses that each discipline, "provides a vital dimension in building organizations that can truly learn, that can continually enhance their capacity to realize their highest aspirations."[21]

In Senge's theory, system thinking is perhaps the most difficult task to accomplish. It is visualizing the entire problem as a single entity with multiple interrelationships. This conceptual cornerstone involves shifting the mind from seeing components to seeing structures: from seeing

[19] Gilles Fauconnier and Mark Turner, The Way We Think: Conceptual Blending and the Mind's Hidden Complexities ( New York: Basic Books, 2002), 75.

[20] Peter Senge, The Fifth Discipline: The Art & Practice of The Learning Organization (NY: Doubleday, 1990), 3.

[21] Ibid, 6.

people powerless to seeing them as having the ability to control events.[22] Personal mastery is the discipline of growth and learning done by individuals within an organization.

Personal mastery is the ability to change a mental model. The three principles associated with personal mastery are: personal vision, creative tension, and commitment to truth. Personal vision is an intrinsic value that specifies a direction toward a desired future. Creative tension is the gap between a personal vision of a desired future and reality. This tension is a source of energy that stimulates the mind's creative process in pursuit of change to achieve the vision. Consistency of personal vision is the only way to effectively manage this creative tension. Commitment to truth deepens the understanding of the complex system that facilitates identification of behavioral conflicts. It does not mean seeking one immutable "Truth," but "continually broadening the awareness and challenge theories, just as a great athlete with extraordinary peripheral vision keeps trying to see more of the playing field."[23]

Mental models, Senge's third discipline, are deeply ingrained assumptions, generalizations, or even pictures and images that influence how an individual understands and takes action.[24] These mental models sometimes exist at the subconscious level and are not readily subject to analysis (conceptual blending).

The fourth discipline of shared vision refers to fostering commitment to a shared vision that unites the organization in the name of a commonly understood goal. This is accomplished through personal mastery. The most direct way to develop a shared vision is to evolve a leader's personal vision. People in the organization commit to the leader's personal vision through

[22] Ibid, 69.

[23] Ibid, 159.

[24] Ibid, 8.

personal mastery; the visual image evolves and becomes more recognizable until everyone shares it.

The final discipline, team learning, is the process of aligning and developing the capacity of a team to create the results its members truly desire.[25] This discipline builds upon the shared vision as well as the collective and personal mastery disciplines. The three critical dimensions of team learning are: the need to think insightfully as a group (thus tapping the resources of a collective); the need for coordinated action, and the inculcation of other teams within the same organization.

Systems thinking is the result of the interaction of the four disciplines. The activity of a learning organization and its ability to arrive at a shared vision is directly applicable to understanding complex problems as non-linear systems.

[25] Ibid, 236.

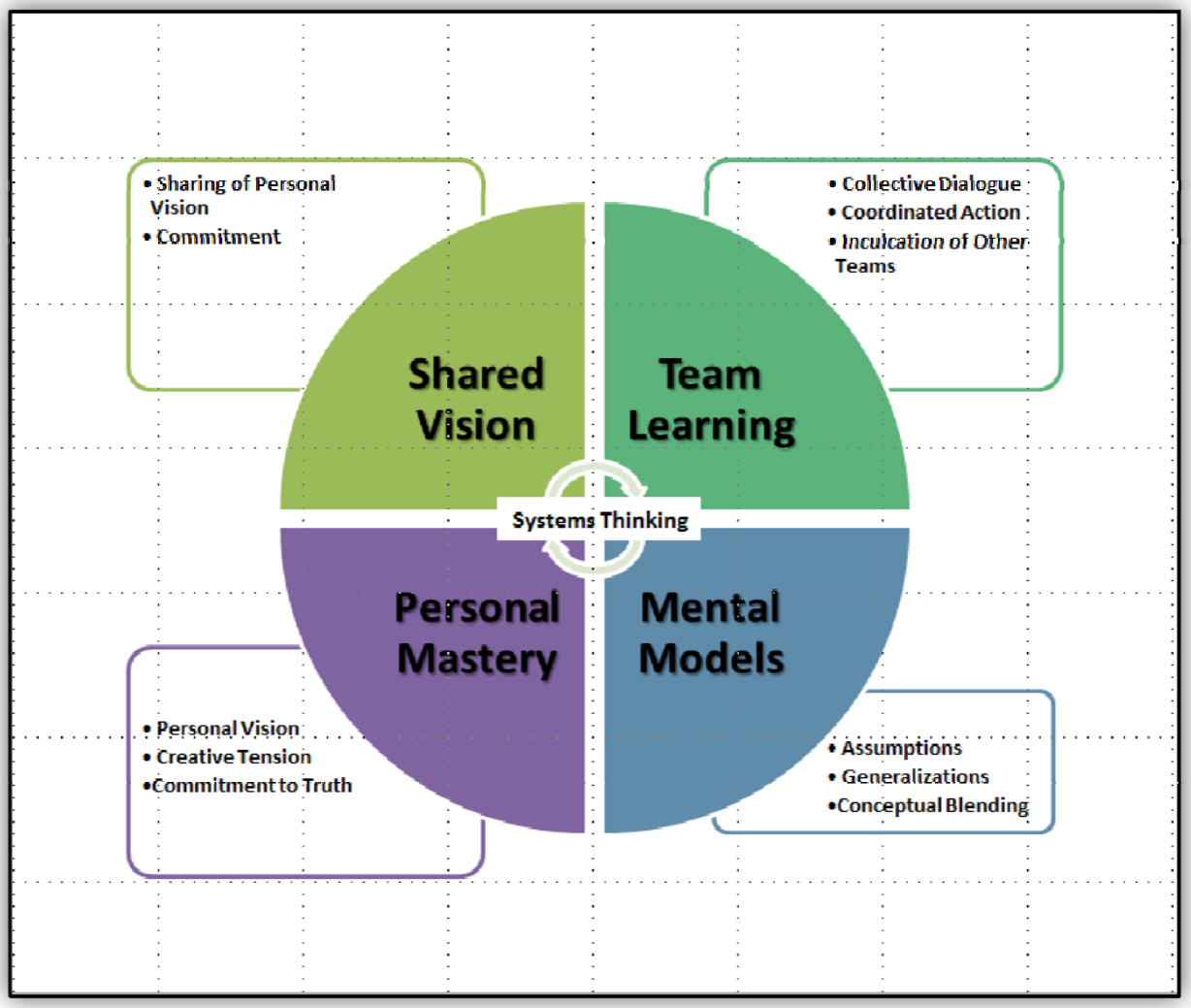


**Figure 6: Senge's Learning Disciplines.**

**Source: Created by author to summarize Peter M. Senge's learning disciplines found in The Fifth Discipline: The Art & Practice of The Learning Organization (NY: Doubleday, 1990).**

Design is a methodology for applying critical and creative thinking to further an understanding from a systems perspective of interdependent variables seeking an internal and external equilibrium to support decisions based on an assessment of capability and ability. Understanding the intellectual components of design presented here as they apply in a military context will further illustrate the value of applying the design school to the military planning process with the premise of avoiding an "attempt to make a science of planning with its subsequent loss of creativity…the drive for administrative efficiency that standardize inputs and outputs and formats at the expense of substance and the dominance of a single technique inappropriately applied."[26]

| **Intellectual Components of Design** |
|---|
| **1. Requires an understanding of complex problems as non-linear systems. Observation, analysis of relationships, extrapolation of data, and the formation of a model, theory, or paradigm.** |
| **2. A critical and creative thinking process. Understanding situations, finding causes, arriving at justifiable conclusions, making good judgments, and learning from experience to solve problems. Using adaptive approaches, drawing from previous similar circumstances, or applying innovative approaches, to develop a completely new idea.** |
| **3. Learning organizations act as complex problem solvers. Personal mastery, mental models, shared vision, and team building.** |

[26] Jeanne M. Leidtka, "Strategy Formulation: The Roles of Conversation and Design", *The Blackwell Handbook of Strategic Management* (UK: Blackwell Publishing, 2005), 90.

## CHAPTER 4: THE MILITARY APPLICATION OF DESIGN

> And it ought to be remembered that there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.
>
> Niccolo Machiavelli

As an introduction, let us apply the concepts of design to war's most famous theorist, Karl von Clausewitz. Clausewitz's masterpiece, *On War*, is standard reading for all military professionals and provides the basis for the modern American military professional's basic understanding of war.

Clausewitz describes war as an extremely complex human endeavor, functioning within a triplicated system in constant flux and tension. He defines the actors in his systems as the people, the military, and the state. What appears harmonious is actually an inherent paradox; what is the most simple is also the most complex; war exists in clear simplicity, but is enveloped in uncertainty, chance and friction. Clausewitz is describing war as the ultimate ill-structured problem. Driven by passions, but balanced by rationalism and subject to innumerable outcomes that are both controlled and uncontrolled leaving the decision maker without a clear path.

As Dietrich Dörner noted, the key to complex systems management is the understanding of casual relationships, their linkages, their roots, and then classifying these relationships either as general behavior or as rare occurrences. Clausewitz supports Dörner's assertion where he wrote that, "The general unreliability of all information presents a special problem in war….which like fog or moonlight, often tends to make things seem grotesque and larger than they really are….War is the realm of uncertainty; three quarters of the factors on which action in

war is based are wrapped in a fog of greater or lesser uncertainty."[1] To gain insight and shared understanding, the leader's vision is critical in the process.

> Any complex action, if it is to be carried on with any degree of virtuosity, call for appropriate gifts of intellect and temperament…the relations between material factors are all very simple; what is more difficult to grasp are the intellectual factors involved…things are perceived, of course, partly by the naked eye and partly by the mind, which fills the gaps of guesswork based on learning and experience, and this constructs a whole out of fragments that the eye can see.[2]

Complexity requires an analytical approach, what Clausewitz terms "a criterion for theory."[3] What must follow is "the application of theoretical truths to actual events" through creative and critical thinking.[4] Clausewitz is often oversimplified because he is often obtuse, made more so by poor translations into English. At its heart, to the perceptive reader, the way to *On War* is the understanding of war in the terms of the percepts of design.

We have multiple interpretations of design with a varying degree of definitions and precepts. The incongruence and dissection of what went wrong in the application of design into military doctrine can be distilled into four major points:

1. Lack of clarity of where design fits.
2. Confusion of design with commander's intent and guidance.
3. Mixing of design and mission analysis.
4. Profusion of terms to replace original design precepts.

## Genesis of Design: 2003-2010

In April 2003 and May 2004, the United States Army and the United States Joint Forces Command (USJFCOM) cosponsored the war games Unified Quest 03 and 04. "The central study question for the war games focused on identifying the concepts and capabilities required to

[1] Carl von Clausewitz, *On War*, ed and trans. Michael Howard and Peter Paret (Princeton NJ: Princeton University Press, 1984), 117, 138, 139, 161.

[2] Ibid, 115, 127, 169, 208.

[3] Ibid, 181.

[4] Ibid, 181.

counteract an adversary who, having lost most of his conventional capability seeks victory through a combination of protracted, unconventional operations and use of weapons of mass destruction."[5] As Thomas Kuhn would describe, the United States military had reached a paradigm shift by using a developmental approach, which deals with the changes in a system over time. The constant theme of Unified Quest was how to design a campaign plan that accounts for the totality of a conflict, not just major combat operations and answer why unconventional warfare frustrates conventional thinking.[6] In August 2005, The Chairman of the Joint Chiefs of Staff published the *Capstone Concept for Joint Operations Version 2.0* that reflected the ideas of Ludwig von Bertalanffy by stressing the importance of applying systems framework to complexity, intended to support an operational design for mission accomplishment.[7]

The catalyst for the Unified Quest war game exercises from 2003 to 2007 was the conduct of operations in Iraq. What became quickly apparent was the failure at the operational level of war, which links the tactical employment of forces to national and military strategic objectives of warfare by the application of the design, planning, and execution of operations using operational art.[8] The political objectives of the operations were bold and ambitious to transform a region and send a clear and powerful message of the consequences of supporting terrorism and pursuing weapons of mass destruction. The military objectives were to strike a blow at terrorism, implant pro-American states in the Arab world, and [in Iraq] eliminate

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[5] David E. Johnson, Peter A. Wilson, Richard E. Darilek, Laurinda L. Zeman, *Joint Paths to the Future Force: A Report on Unified Quest 2004* (Santa Barbara CA: Rand Corporation, 2006), xi.

[6] Ibid, 33, 39.

[7] Joint Chiefs of Staff, *Capstone Concept for Joint Operations 2.0* (Washington DC: Joint Chiefs of Staff, August 2005), C-1, D-1.

[8] Summation by author for clarity of the concepts of operational level of war and operational art found in Joint Staff, Joint Publication 3-0, *Joint Operations* (Washington D.C.: U.S. Government Printing Office, 11 August 2011), I-13.

weapons of mass destruction. Gordon and Trainor provide a critical summary of the decisions in *Cobra II: The Inside Story of the Invasion and Occupation of Iraq*, and noted five grievous errors made that point to a failure or lack of design.[9]

1. Failed to understand the nature of the problem.
2. Put too much confidence in technology and not the problem solution.
3. Failed to adapt to developments on the ground and remained wedded to a prewar analysis, even after the enemy showed penchant for guerilla tactics in the first days of the war. Failed to understand the complexity of the system that was being influenced.
4. Presided over a system in which differing military and political perspectives were discouraged. Problem solvers were not unified.
5. Misunderstood what was controllable and what was not. Used nation building lessons from the Balkans and other crisis.

Here are the essential portions that are inherent on design: understanding system complexity, examining the influences to the system, and understanding the nature of the problem.

## 2004-2006: Systemic Operational Design (SOD)

Starting in Academic Year 2004, the School of Advanced Military Studies (SAMS) at Fort Leavenworth, Kansas began to embrace the concept of Systemic Operational Design (SOD). This theory was developed by Brigadier General (retired) Shimon Naveh of the Israeli Defense Force, to counter the irregular tactics of the Hezbollah. His premise was that the Napoleonic-style of warfare and an adherence to a Clausewitizian dogma within Western militaries served to obfuscate the relationship between the strategic and tactical levels of war.

This theory was even more attractive as Unified Quest began to call into question the value of Clausewitz in irregular warfare. The Army's SAMS incorporated SOD, and students participated in Unified Quest in 2005 and 2006 to apply the concepts of SOD. The concept of SOD postulates the critical variable of systems interaction is the intention or purpose; an entity is

[9] Michael R. Gordon and Bernard F. Trainor, Cobra II: The Inside story of the Invasion and Occupation of Iraq (NY: Pantheon Books, 2006), 497-507.

purposeful if it can produce the same outcome in different ways in the same environment, or conversely, produce different outcomes in the same way in a different environment.[10] SOD implies that decision makers can be influenced to take a certain action, a socio-cultural view that permeates this approach to warfare. Rather than relying on a presumed certain understanding or complete information, SOD recognizes that uncertainty is an attribute of complex adaptive systems and addresses it through continuous reframing, a process of injecting energy into a multi-minded system through action to learn more about, or discover, its purpose.

SOD is a process with two separate phases: design and planning. "Design focuses on learning, while planning concentrates on action (it) does not replace the planning process; it incorporates the element of design to enlighten planning."[11] The concept of the plan is developed through a series of design steps before being turned into an executable plan in the planning phase.[12] The design phase consists of two distinct steps (system framing and operation framing) with seven sub-steps that are known as framed discourses. The seven discourses are systems framing, rival as rationale, command as rationale, logistics as rationale, operation framing, operational conditions, and forms of function. (Figure 8 details the various contributing elements to each of the seven discourses)

[10] Major Ketti Davison, "From Tactical Planning to Operational Design," *Military Review*, September-October 2008, 37.

[11] Major Ketti Davison, "Systemic Operational Design (SOD): Gaining and Maintaining the Cognitive Initiative." Monogrpah, School of Advanced Military Studies, United States Army Command and General Staff College. (Fort Leavenworth, KA: 25 May 2006), 32.

[12] Matthew Lauder, "Systemic Operational Design: Freeing Operational Planning From the Shackles of Linearity", *Canadian Military Journal*, Volume 9, No.4, 2009, 37.

| Precepts of SOD / The Seven Discourses | |
|---|---|
| **Systems Framing** | Used to create an understanding of the problem-space in relation to the strategic goal, and consists of identifying and bounding the problem-space (i.e., what has changed that requires intervention). |
| **Rival as Rationale** | Used to define the rival by examining the logic, motives, intent, behaviors, culture, economics, and interrelationships of the rival with other entities in the system. |
| **Command as Rationale** | Used to define the tensions between the current (Blue Force) command structure and the command structure that is likely required by the emerging design. |
| **Logistics as Rationale** | Used to examine strategic mobilization and delivery, strategic-operational deployment, and operational-level sustainability in order to ensure that logistics can be delivered in the time and space required. |
| **Operational Framing** | Used to narrow the focus of the operation, provide a framework on how to conduct the operation (i.e., to identify the ways and means), establish the temporal and spatial boundaries of the operation, and identify the operational conditions that are to be achieved. |
| **Operational Effects** | Used to examine the conditions within the system that, if achieved, will prompt a transformation towards the desired end-state. |
| **Forms and Functions** | Used to translate the operational logic of effects and conditions into activities, which serves as the basic design for detailed planning. |

**Figure 7: Seven Discourses (Precepts) of SOD.**

**Source: Created by author summarizing Matthew Lauder, "Systemic Operational Design: Freeing Operational Planning From the Shackles of Linearity", *Canadian Military Journal*, Volume 9, No. 4, 2009, 37-38.**

Each of these seven framed discourses build upon one another to produce a narrative text that explains the logic of the system; a visualization sketch that embodies the logic of the form of maneuver, and a conceptual map that communicates the holistic impression of the body of knowledge.[13] In irregular warfare, SOD appeared to solve the problem through a deep understanding of the enemy to influence the insurgents' motivations and decision through actions taken by the friendly forces.

[13] Major Ketti Davison, "From Tactical Planning to Operational Design," *Military Review*, September-October 2008, 38.

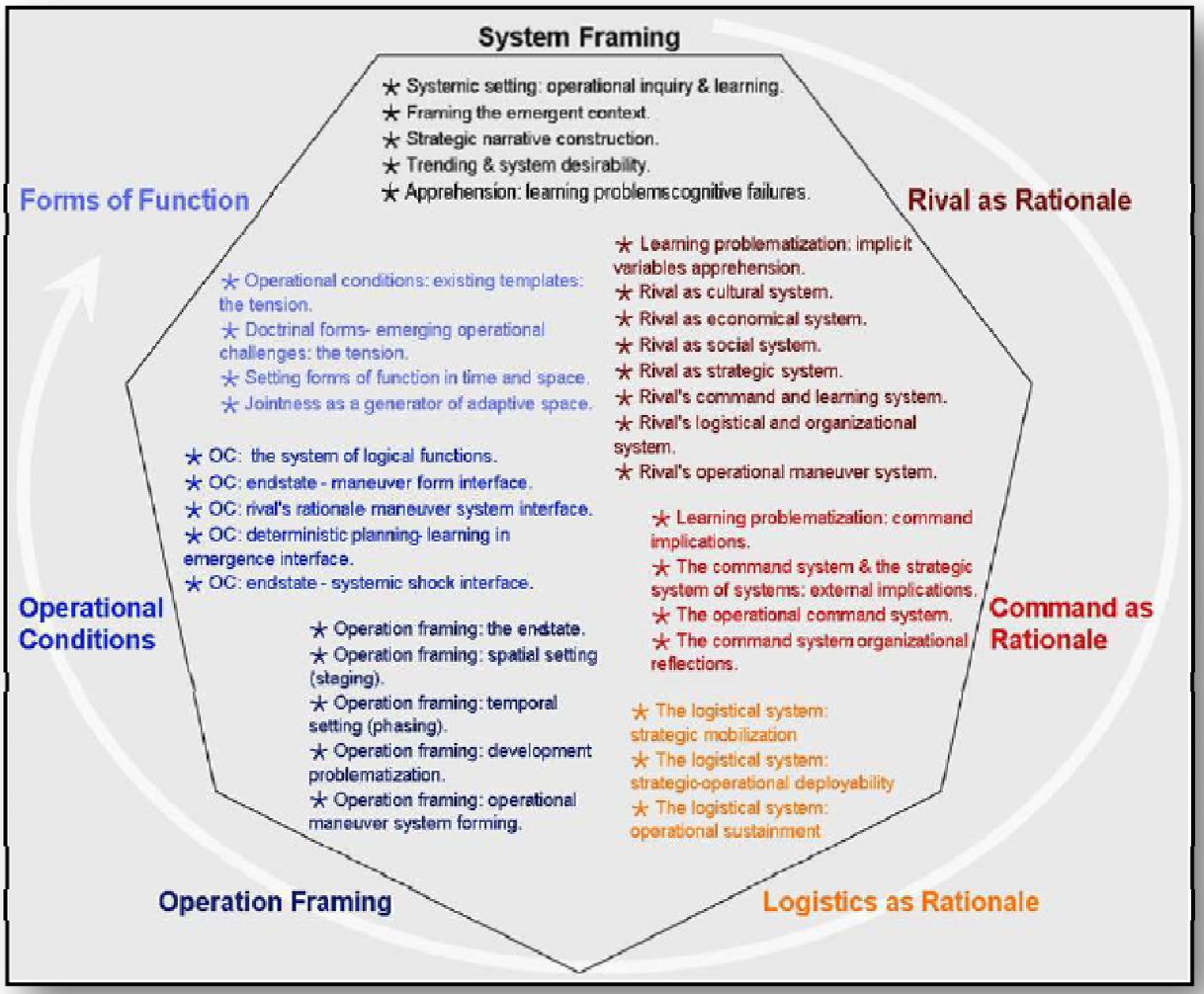


**Figure 8: Components of SOD.**

**Source: Major Ketti Davison, "Systemic Operational Design (SOD): Gaining and Maintaining the Cognitive Initiative." School of Advanced Military Studies, United States Army Command and General Staff College. (Fort Leavenworth, KA: 25 May 2006), 33.**

In the quest to develop the panacea to solve the irregular warfare problems the military was currently facing, SOD became an attractive alternative to traditional planning methodologies. SOD, however, perverts Dörner's theory that a complex system is in constant flux, with variables dynamically interacting with each other over time and causing the system to react in ways that may be "in-transparent" or not yet visible. SOD postulates that the system is

like a vending machine – input money, press selection, and get desired results. From an insurgency, the approach links all tactical actions to strategic aims. By linking every tactical action (an effect) to a strategic outcome, it is intended to allow commanders to execute intent. Therefore, according to SOD, strategic thinking and understanding is the key to solve complex problems. SOD had an influence on U.S. counterinsurgency doctrine.

### 2006: FM 3-24/MCWP 3-33.5 Counterinsurgency

The first attempt to develop a doctrine from design came in December of 2006 when the Army and Marine Corps published FM 3-24/MCWP 3-33.5 *Counterinsurgency*, dedicating an entire chapter to designing counterinsurgency campaigns and operations. According to the FM, "the purpose of design is to achieve a greater understanding, a proposed solution based on that understanding, and a means to learn and adapt."[14] This idea reflects SOD thinking.

It further delineates design and planning: "Design and planning are qualitatively different yet interrelated activities essential for solving complex problems. While both activities seek to formulate ways to bring about preferable futures, they are cognitively different. Planning applies established procedures to solve a largely understood problem within an accepted framework. Design inquiries into the nature of a problem to conceive a framework for solving that problem. In general, planning is problem solving, while design is problem setting."[15]

[14] U.S. Army, *Counterinsurgency*, Field Manual 3-24 (Washington DC: Department of the Army, 15 December 2006), 4-1.

[15] Ibid, 4-2, 4-3.

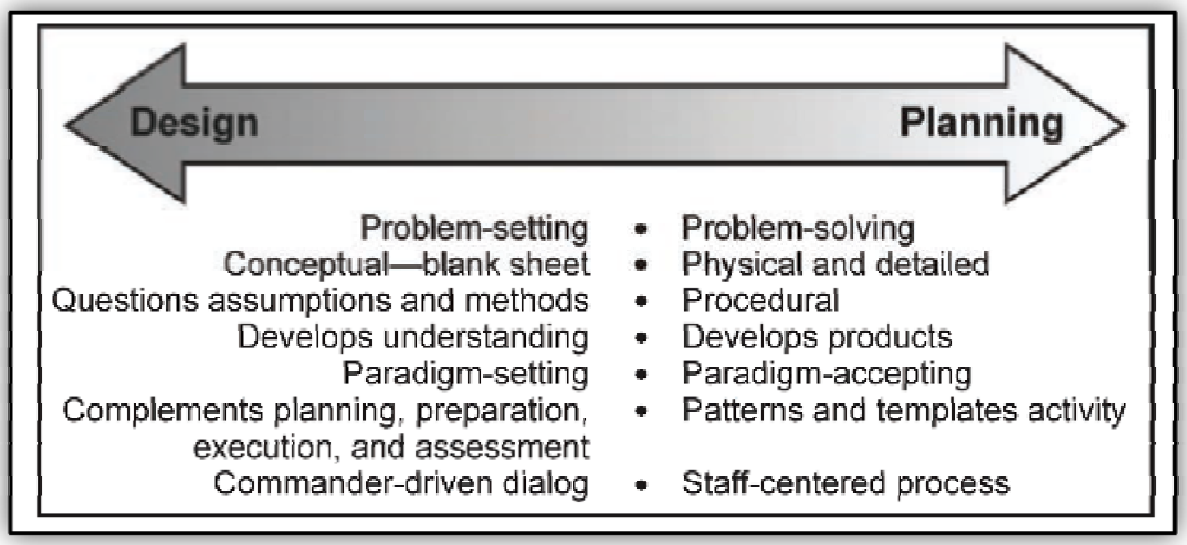


**Figure 9. Army Delineation between Design and Planning.**

**Source: U.S. Army, Counterinsurgency, Field Manual 3-24(Washington DC: Department of the Army, 15 December 2006), 4-3.**

This is the first time design was associated with planning. Although qualitatively different, design became part of the planning in terms of problem solving and not the intellectual effort separate and distinct from planning. Focusing on the commander was a good idea and congruent with Mintzberg's third premise of having only one strategist as the command and control entity, but applied no methodology to accomplish design. Figure 9 simply lists definitional aspects between design and planning. Six key design considerations were addressed: critical discussion, systems thinking, model making, intuitive decision-making, continuous assessment, and structured learning.[16]

[16] Ibid, 4-9 to 4-19.

| Six Precepts for Design from FM 3-24/MCWP 3-33.5 *Counterinsurgency* | |
|---|---|
| **Critical discussion** | Shared understanding and leverages the collective intelligence and experiences of many people. |
| **Systems thinking** | Understanding the interconnectedness, complexity, and wholeness of the elements of systems in relation to one another. |
| **Model making** | Describes an approach to the campaign with operational terms of reference and concepts that shape the language governing the conduct (planning, preparation, execution, and assessment) of the operation. |
| **Intuitive decision making** | The act of reaching a conclusion which emphasizes pattern recognition based on knowledge, judgment, experience, education, intelligence, boldness, perception, and character. |
| **Continuous assessment** | Identify where and how the design is working or failing and to consider adjustments to the design and operation. |
| **Structured learning** | Develop a reasonable initial design and then learn, adapt, and iteratively and continuously improve that design. |

In comparing this approach with the original school of design it becomes clear that the Army and USMC adopted some of the six school of design precepts found in figure 3, but failed to make a clear distinction between thinking and implementation of action. As Senge described, learning organizations act as complex problem solvers through personal mastery, mental models, shared vision, and team building. FM 3-24/MCWP 3-33.5 *Counterinsurgency* separates problem setting through design and problem solving through planning (figure 9). Whereas the school of design states that another structure must follow design and is reflective of planning, FM 3-24/MCWP 3-33 recognizes these as two distinct processes, but fails to describe how they are interrelated.

## 2008: TRADOC Pamphlet 525-5-500, Commander's Appreciation and Campaign Design (CACD)

In 2008 the United States Army Training and Doctrine Command (TRADOC) issued Pamphlet 525-5-500, *Commander's Appreciation and Campaign Design (CACD)*. This pamphlet

was developed over a three-year period during a series of seminars, academic experimentation, the result of the Unified Quest war games, and incorporating recent operational experiences from 2006, as well as the elements of SOD. The CACD proposes:

> A method for commanders to develop a shared understanding of complex operational problems within their commands (commander's appreciation) and design a broad approach for problem resolution that links tactical actions to strategic aims (campaign design). It responds to the need for greater strategic thinking at all echelons when facing complex operational problems.[17]

In roughly 50 pages, this pamphlet describes systems and complexity theory, dealing with various types of problems, and correlating campaign design to industry and business aspects of engineering. CACD' s problem typology and solution strategies (figure 10) of well-structured, medium-structured, and ill-structured were borrowed from Horst Rittel and Melvin Webber and its thesis is that the more complex a problem, the greater need for using campaign design. "If the problem is unstructured or the mission received from higher headquarters is not properly framed, or higher headquarters provided no clear guidance, then it is crucial to begin by starting to identify and understand the operational problem systemically."[18] However, Rittel and Webber stated that "In order to describe a wicked-problem in sufficient detail, one has to develop an exhaustive inventory of all conceivable solutions ahead of time. The reason is that every question asking for additional information depends upon the understanding of the problem--and its resolution--at that time. Problem understanding and problem resolution are concomitant to each other."[19] This starts the profusion of borrowing and misapplying terms to replace original design precepts and furthering the lack of clarity of where design fits.

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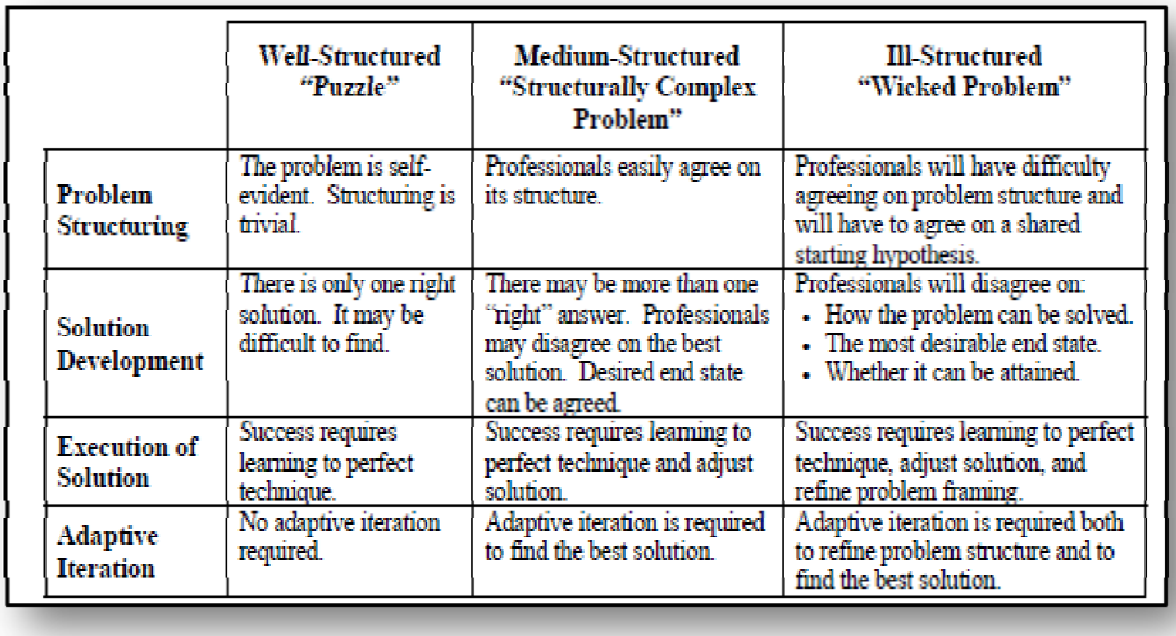
[17] U.S. Army, *Commander's Appreciation and Campaign Design Version 1.0*, TRADOC Pamphlet 525-5-500 (Virginia: TRADOC, 28 January 2008), i.

[18] Ibid, 12.

[19] Rittel and Webber, 161.



| | Well-Structured "Puzzle" | Medium-Structured "Structurally Complex Problem" | Ill-Structured "Wicked Problem" |
|---|---|---|---|
| **Problem Structuring** | The problem is self-evident. Structuring is trivial. | Professionals easily agree on its structure. | Professionals will have difficulty agreeing on problem structure and will have to agree on a shared starting hypothesis. |
| **Solution Development** | There is only one right solution. It may be difficult to find. | There may be more than one "right" answer. Professionals may disagree on the best solution. Desired end state can be agreed. | Professionals will disagree on:<br>• How the problem can be solved.<br>• The most desirable end state.<br>• Whether it can be attained. |
| **Execution of Solution** | Success requires learning to perfect technique. | Success requires learning to perfect technique and adjust solution. | Success requires learning to perfect technique, adjust solution, and refine problem framing. |
| **Adaptive Iteration** | No adaptive iteration required. | Adaptive iteration is required to find the best solution. | Adaptive iteration is required both to refine problem structure and to find the best solution. |

**Figure 10: CACD Problem Types.**

**Source: U.S. Army, Commander's Appreciation and Campaign Design Version 1.0, TRADOC Pamphlet 525-5-500 (Virginia: TRADOC, 28 January 2008), 9.**

In departure from previous treatments of the term operational art, CACD defines operational art from a problem solving perspective as "taking an unstructured problem and giving it enough structure so that further planning can lead to useful action."[20] Military planners perform both functions as designers and engineers; the level and interaction of designing and engineering depends on the complexity. Designing focuses on learning about the unfamiliar problem and then creating a conceptual approach or paradigm to solve the problem. On the other hand, engineers must operate within existing paradigms, follow established procedures and develop detailed plans of action – blueprints.

[20] TRADOC Pamphlet 525-5-500, 13.

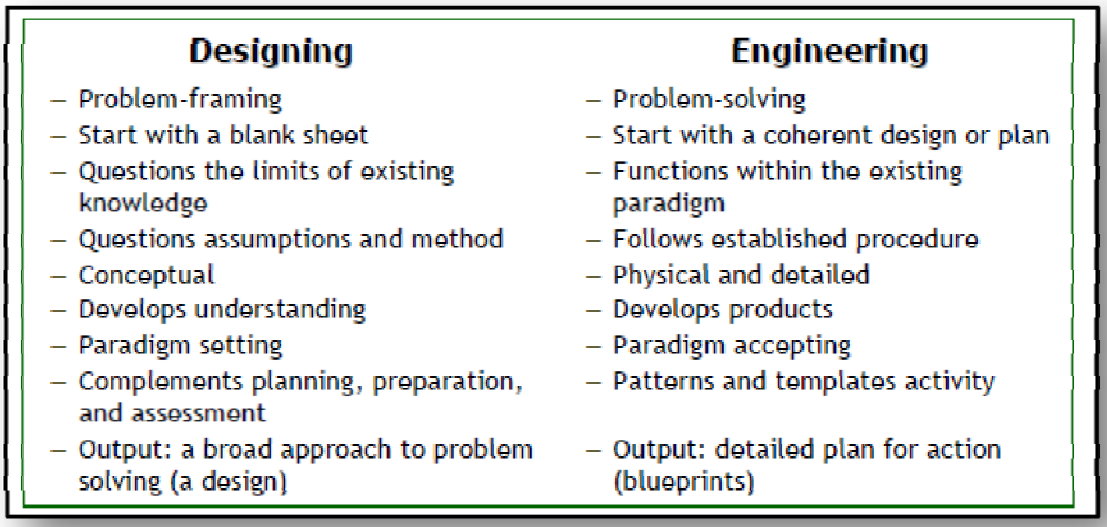



**Figure 11: CACD Comparison between Design and Engineering.**

**Source: U.S. Army, Commander's Appreciation and Campaign Design Version 1.0, TRADOC Pamphlet 525-5-500 (Virginia: TRADOC, 28 January 2008), 13.**

Figure 11 provides a comparison of these processes and borrows many concepts from the 2006 FM 3-24 *Counterinsurgency* found in figure 9. The conundrum of where design relates to planning is further illustrated in figure 12, where design is suited for ill-structured problems; "This is one of the functions of operational art, solving complex problems contains more of the cognitive elements of design, whereas the detailed planning for execution relies more heavily on the cognitive functions of engineering."[21]

[21] Ibid, 14.

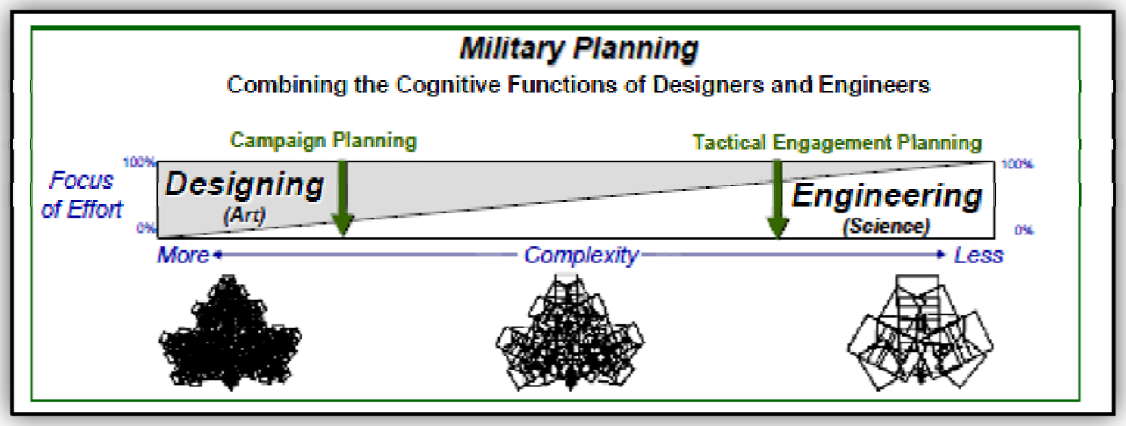



**Figure 12. The Delineation within Military Planning (CACD).**

**Source: U.S. Army, Commander's Appreciation and Campaign Design Version 1.0, TRADOC Pamphlet 525-5-500 (Virginia: TRADOC, 28 January 2008), 14.**

CACD used the experiences from the 2006-2007 Unified Quests to develop two broad approaches in campaign planning: commander's appreciation and campaign design. Figure 13 summarizes these approaches as well their components. Commander's appreciation is defined as, "gaining an appreciation for what must be done and solving the problem presented to the commander requires a comprehensive understanding of the situation within which his subordinate organizations will operate. Commander's appreciation includes problem framing and mission analysis. Problem framing is the art of seeing the essential and relevant among the trivial and irrelevant; penetrating the logic of the broad received mission and its messy contextual situation; and reshaping it into a well-enough structured working hypotheses."[22]

[22] Ibid, 21.

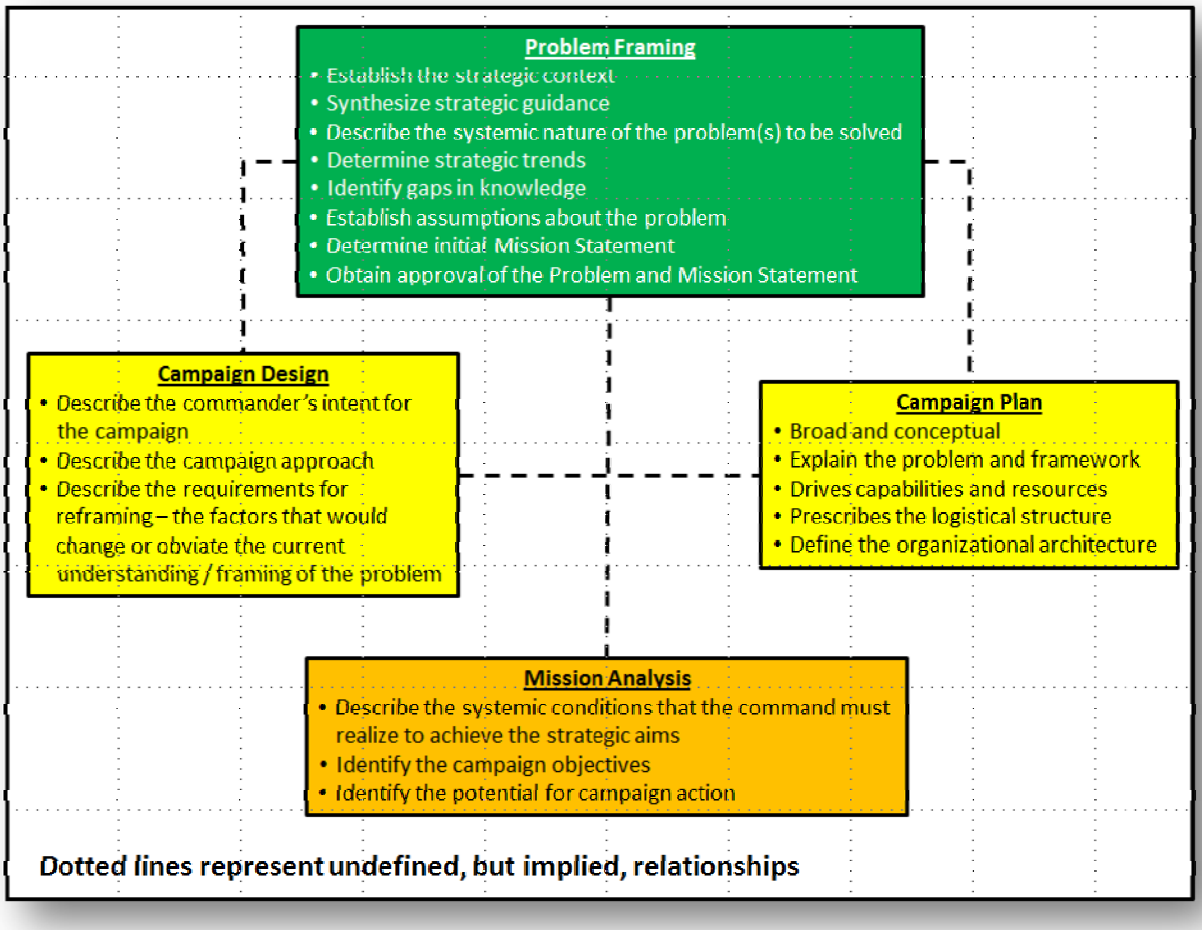



**Figure 13: CACD Campaign Plan Development.**

**Source: Created by Keith Dickson to summarize Chapter 2 and Chapter 3 from U.S. Army, Commander's Appreciation and Campaign Design Version 1.0, TRADOC Pamphlet 525-5-500 (Virginia: TRADOC, 28 January 2008).**

Once the commander approves the problem statement and initial mission statement, mission analysis is conducted. CACD warns that this not the traditional mission analysis found in the military decision making process (planning) rather it is an, "analysis toward understanding how the problem might be solved. It focuses on a deconstruction of the operational problem, within its unique context to determine the "who, what, where, when, and how" of solving it."[23] The

[23] Ibid, 26.

mission analysis includes defining the operational end state, operational objectives, and campaign action. Although not explicitly stated, campaign action implies a center of gravity analysis using the Strange model of critical capabilities, critical requirements, and critical vulnerabilities.

Once this appreciation (largely undefined) has been accomplished, the approach shifts to designing the campaign and developing the campaign plan. The campaign design includes defining the commander's intent, the structure for synchronizing operations, the overall approach to achieving the operational objectives, transitions, Commander's Critical Information Requirements (CCIR) and describing the requirements for reframing "the factors that would change or obviate the current understanding/framing of the problem."[24] The last step is developing the campaign plan which explains the problem(s) and the framework derived from the campaign design. Additional elements of the campaign plan include defining organizational architecture, logistical structure, and capabilities and resources.

The CACD approach to design appears to be an amalgamation of what used to be operational art with the operational planning process applied to only complex problems by a commander who engages in a dialogue with his staff. CACD implies a continuum between design and planning where lines are often blurred and indistinct. Design is a production of good ideas, while questioning everything, while also establishing paradigms for others to extrapolate from. Thus, design does everything and the planners simply implement whatever is produced through the MDMP/JOPP. This is in contrast to both Mintzberg and Andrews who recognized that design is a controlled, deliberate, and conscious process of thought where action must flow from reason. Complexity vis-à-vie the problem structure is the criterion to determine whether to

[24] Ibid, 30.

design or not to design and infers that such complexity or ill-structured problem exists only at the operational level. Russell Ackoff recognized that complexity exists not as a criterion whether to use design or not, but that complexity exists when defining the system of controlled and uncontrolled variables as they relate to the environment (figure 4). Existing doctrinal planning and operational terms are injected into campaign design: mission analysis, end state, objectives, center of gravity, operational art, CCIR, intent, approach, creating multiple meanings.

## 2009-2010: A Year in Transition

As the Army and Marine Corps begin to promulgate and experiment with the new paradigm of design, the remainder of the joint community was still applying the doctrinal concepts of Effects Based Operations (EBO), Operational Net Assessment (ONA), and Systems Of Systems Analysis (SOSA). However, in autumn of 2008, General James N. Mattis, Commander of United States Joint Forces Command (USJFCOM), published an article in *Parameters* assessing that "the ideas reflected in EBO, ONA and SOSA have not delivered on their advertised benefits and that a clear understanding of these concepts has proven problematic and elusive for US and multinational personnel."[25]

By 2009, Huba Wass de Czege, Shimon Naveh, and a few instructors from the Army's SAMS broke away from the military institution and formed the Center for the Application of Design (CAD) under the umbrella of the consulting firm Booz, Allen, and Hamilton. SOD and its design concepts became the intellectual property of CAD and further use of, or instruction in, SOD would require consulting fees, thus ending its formal use with the United States military.

On 6 October 2009, General Mattis issued a memorandum for USJFCOM formalizing operational design as the way forward and that the command "will assume advocacy for

[25] General James N. Mattis. "USJFCOM Commander's Guidance for Effects based Operations," *Parameters,* Autumn 2008, 19-20.

migrating design-related improvement to joint doctrine, joint training, and joint professional military education as swiftly as possible."[26] What emerged is the *Planner's Handbook for Operational Design (Version 1.0),* Joint Staff J7, 7 October 2011, but there is still confusion remains as to what design is or how it applies to doctrine, training, and education.

## 2010-2011: Design as Doctrine

2010 and 2011 marked a turning point for promulgating the concepts of design into doctrine. The United States Army published Field Manual 5-0: *The Operations Process* in March 2010 and the Joint Staff published Joint Publication *5-0: Joint Operation Planning* (August 11). These two publications best encapsulate many years of evolutionary development and provide the best summation of the application of design into military doctrine.[27]

### *March 2010: Field Manual 5-0: The Operations Process*

In March of 2010, the Army formally codified the application of design in Field Manual 5-0, *The Operations Process*. The Army views design as one of its three planning methodologies, the other two being the Military Decision Making Process (MDMP), applicable at the battalion level and higher and Troop Leading Procedures (TLP), applicable at the company level and lower. [28] It further defines design as, "a methodology for applying critical and creative thinking to understand, visualize, and describe complex, ill-structured problems and develop

[26] General James N. Mattis. "Memorandum for USJFCOM, Subject: Vision for a Joint Approach to Operational Design", 06 October 2009, 1-2.

[27] The author does recognizes that many other publications have further influenced design such as: Air Force's Operational Design: Shaping Decision Analysis thorugh Cognitive Vision (October 2008), Army's SAMS, *Art of Design: Student Text Version 2.0* (May 2010), Marine Corps' *MCWP 5-1: The Marine Corps Planning Process* (August 2010), Joint Doctrine Series Pamphlet 10 *Design in Military Operations: A Primer for Joint Warfighters* (September 2010), and Joint Staff J7: *Planners Handbook for Op Design* (October 2011).

[28] The Military Decision Making Process is a seven step process: receipt of mission, mission analysis, course of action development, course of action analysis, course of action comparision, course of action approval, and orders production.

approaches to solve them."[29] The design methodology has five fundamentals: apply critical thinking, understand the operational environment, solve the right problem, adapt to dynamic conditions, and achieve the designated goals. The choice to use design as a method rests with the commander and his assessment of the situation and the complexity of the problem.

The Army design process begins with a holistic understanding of the operational environment and framing the problem through collaboration and dialogue. Using design precepts, military commanders can employ operational art to cement the link that defines the approach to meeting strategic objectives through tactical action to meet conditions that ultimately define the desired end state. Design results in an understanding of the operational environment and the problem. The three distinct elements that collectively produce the design concept are framing the operational environment, framing the problem, and considering operational approaches (See Figure 14).

[29] U.S. Army, *The Operations Process*, Field Manuel 5-0 (Washington DC: Department of the Army, 18 March 2010), Glossary-3.

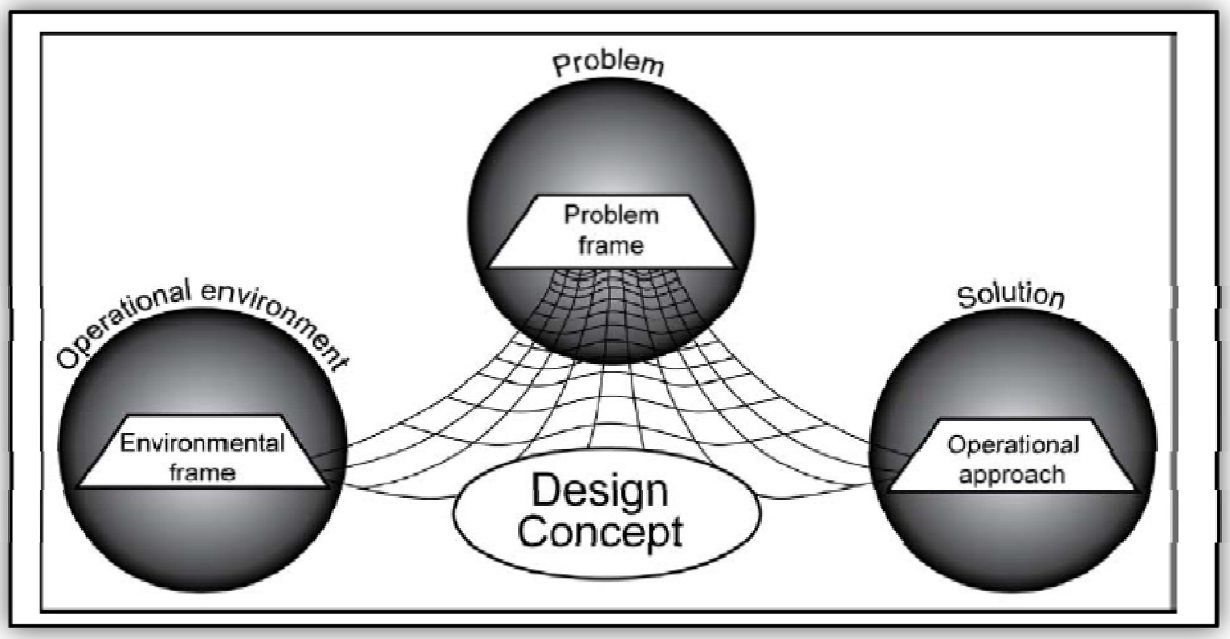



**Figure 14. The Army Design Methodology.**

**Source: Found in U.S. Army, *The Operations Process*, Field Manuel 5-0 (Washington DC: Department of the Army, 18 March 2011), 3-36.**

Framing the operational environment begins with an analysis of the context of the situation given from a higher authority and an examination of the dynamic interactions and relationships. This is another fallacy, design does not work this way and not surprisingly, the manual never explains how this is done. The purpose of the environmental frame is to allow commanders to review existing guidance, articulate existing conditions, determine the desired end state and supporting conditions, and identify relationships and interactions among relevant operational variables and actors.[30] Once the environmental frame is completed, the design team completes a narrative and graphic description of the operational environment from its current state to its future goals.

[30] Ibid, 3-44.

The second element of framing the problem involves understanding the root cause and defining the problem. It begins with identifying the tensions between the existing conditions, found in the environmental frame, and the desired end state. "In the problem frame, analysis identifies the positive, neutral, and negative implications of tensions in the operational environment given the differences between existing and desired conditions."[31] Upon completion of framing the problem, the staff produces a graphic description and narrative.

After both the environment and problem is framed, the commander considers operational approaches or a "broad conceptualization of the general actions that will produce the conditions that define the desired end state."[32] This broad conceptualization is not represented by courses of action, as those are completed during MDMP; rather it is the logic that underpins the unique combination of tasks required to achieve the desired end state. One method to depict the operational approach is by using lines of effort that provide a graphic to articulate the link among tasks, objectives, conditions, and the desired end state. [33]

Although the Army follows the design originators in describing the outcome of design, it provides no prescription for how these results are obtained. This overly simplistic approach leads some critics to dismiss design as nothing more than commander's guidance formulation. The idea that the problem is separate from the environment is fallacious and misleading the design processes. In other words, as Senge and Mintzberg clearly show, design works to establish a problem and then examine and evolve solutions. The Army gets design wrong by combining design with mission analysis. What is perhaps even more erroneous is the introduction of military terms such as end state, lines of effort, and operational approach that further confuses at

[31] Ibid, 3-55.

[32] Ibid, 3-58.

[33] Ibid, 3-59.

what level of command design is intended to work. For example, is a battalion commander going to determine an end state in an operational level approach? This is the work of the Joint Task Force (JTF); yet the Army does not make it clear that this is the purpose of design. This adulterates design's purpose and structure as a means of providing understanding and insight at the proper level. The Army implies a one size fits all approach to design, completely missing what design was originally intended to do – address strategy and develop plans to support its implementation.

| **FM 5-0 *The Operations Process* Design Precepts** | |
|---|---|
| **Environmental Frame** | Allows commanders to review existing guidance, articulate existing conditions, determine the desired end state and supporting conditions, and identify relationships and interactions among relevant operational variables and actors. |
| **Problem Frame** | Understanding the root cause and defining the problem. It begins with identifying the tensions between the existing conditions, found in the environmental frame, and the desired end state. |
| **Operational Approach** | Broad conceptualization of the general actions that will produce the conditions that define the desired end state. |

In Field Manual *5-0: The Operations Process*, the United States Army took an esoteric approach to design by stating that it is one of three planning methodologies and used for those problems that are complex and ill-structured. It defines design as "a methodology for applying critical and creative thinking to understand, visualize, and describe complex, ill-structured problems and develop approaches to solve them."[34]

Because the Army considers design as planning, it misapplies the concept. The manual describes design as a thinking process and makes it the domain of the commander and keeping

[34] Ibid, Glossary-3.

with CACD. Army doctrine is silent on how the commander, presumably at every level of command, is to think his way through complex problems to give guidance. Thus, design as a disciplined team method for gaining understanding as defined by Senge's learning organization is lost. The Army further confuses the concept by stating that design and planning can occur simultaneously. This idea violates all of the design concepts outlined by its originator. It violates the purpose and benefits and reduces design into nothing more than brainstorming.

### *August 2011: Joint Publication 5-0: Joint Operation Planning*

The most recent doctrinal publication in the application of design is Joint Publication 5-0: *Joint Operation Planning* published in 2011. Joint doctrine refers to design in the operational paradigm in the same frame as operational approach and operational art. It further defines operational design as "the conception and construction of the framework that underpins a campaign or major operation plan and its subsequent execution."[35] Often described as the operational approach; "the broad actions the force must take to reach the desired end state. It is the visualization of how the operation should transform current conditions into the desired conditions at end state."[36]

Joint doctrine defines the interaction between operational art and operational design as a link between strategy and tactics thus nesting strategic aims to tactical operations through unified action. Operational design supports operational art and developing an operational approach with a general methodology and ongoing dialogue using elements of operational design for understanding the situation, the problem and then solving complex, ill-defined problems. The

[35] U.S. Joint Staff, *Joint Operation Planning*, Joint Publication 5-0 (Washington DC: Joint Chiefs of Staff, 11 August 2011), GL-19.

[36] U.S. Joint Staff, *Joint Operation Planning* , Joint Publication 5-0 (Washington DC: Joint Chiefs of Staff, 11 August 2011), GL-19.

operational approach is based on the understanding of the operational environment and the problem and once approved becomes the basis for further detailed planning using the JOPP.

| **Joint Publication 5-0: *Joint Operation Planning* Operational Design Precepts** | |
|---|---|
| **Understanding the Strategic Direction** | Define what constitutes "victory" or success (ends) and allocate adequate forces and resources (means) to achieve strategic objectives. The operational approach (ways) of employing military capabilities to achieve the ends is for the supported JFC to develop and propose. |
| **Understanding the Operational Environment** | Understanding the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander. |
| **Defining the Problem** | Understanding the root causes of the complex, ill-defined problem and what is required to reconcile the differences between existing and desired conditions. |
| **Develop an Operational Approach** | Understanding of the operational environment and the problem while describing the commander's visualization of a broad approach for achieving the desired end state. |

Operational design uses thirteen elements (see Figure 15) as key considerations in order refine and develop the operational approach. The specific application of each element depends on the circumstances and type of operations, but is "useful in developing the operational approach and throughout JOPP."[37] Throughout JP 5-0's Chapter III: Operational Art and Operational Design the elements of operational design were mentioned as components to various portions of the decision making process. It identified six elements that are part of describing the operational approach, four that were considered optional, and three that were not mentioned with clarity. By making these artificially as components of design, JP 5-0 does a disastrous disservice by completely abandoning the true purpose of design. Joint doctrine cannot clearly differentiate

[37] Ibid, III-18.

operational design (which has elements) and operational approach (which also shares many of these elements).

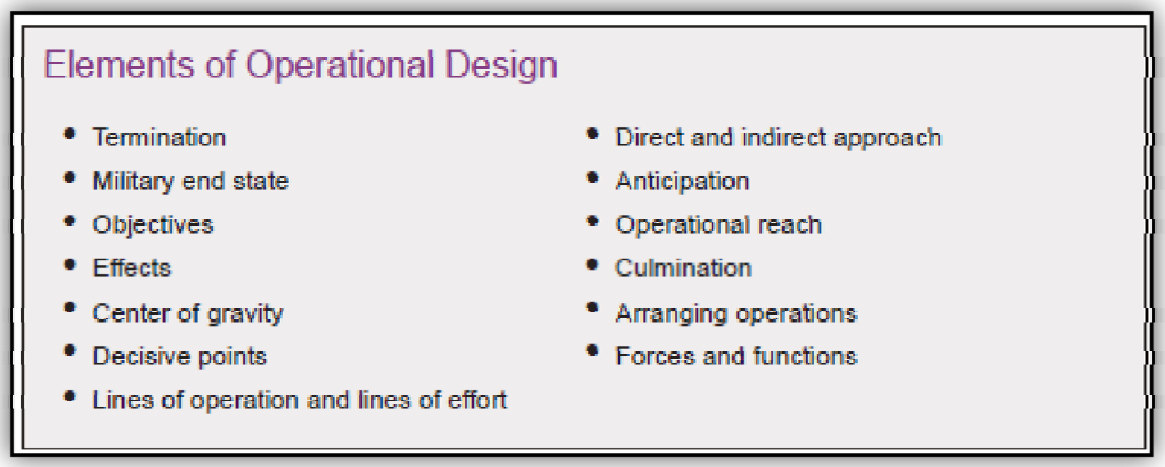



**Figure 15: Elements of Design (Joint).**

**Source: U.S. Joint Staff, *Joint Operation Planning*, Joint Publication 5-0 (Washington DC: Joint Chiefs of Staff, 11 August 2011), III-18.**

The below table (Figure 16) summarizes the parceling of these elements and assumes that anticipation applies to all three domains and the remainder apply more to JOPP. This thesis does recognize the danger of parceling cognitive elements, but argues that once the language such as "required" and "optional" were used violated its true nature.

| Joint Publication 5-0: Joint Operation Planning Elements of Design | | |
|---|---|---|
| **Required** | **Optional** | **JOPP** |
| Anticipation | | |
| Termination | Direct / Indirect Approach | Effects |
| Military End State | Operational Reach | Forces and Functions |
| Objectives | Culmination | |
| Center of Gravity | Arranging Operations | |
| Decisive Points | | |
| Lines of Operation / Effort | | |

**Figure 16: Parceling the Elements of Design.**

**Source: Created by author to summarize the parceling of elements of design found in U.S. Joint Staff, *Joint Operation Planning*, Joint Publication 5-0 (Washington DC: Joint Chiefs of Staff, 11 August 2011), III-18 to III-36.**

Figure 17 below shows the interaction of understanding the environment, defining the problem, and developing an operational approach by using the elements of operational design. JP 5-0 added the strategic level and copied the Army design methodology found in figure 14. Joint doctrine, like the Army, focused too much emphasis on problem structure and not enough on understanding and applying a systems approach. In comparison to both operational art and operational approach this publication fell short in its ambiguous application of the word "operational" when defining operational design as "the conception and construction of the framework that underpins a campaign or major operation plan and its subsequent execution." [38]

Operational approach also adds terms such as defeat/stability mechanisms and current and desired conditions without further doctrinal exploration; they just seem to exist within JP 5-0, but remain undefined in the glossary. Joint doctrine defines operational environment and operational approach with three distinct outputs: understand the environment, define the

[38] U.S. Joint Staff, *Joint Operation Planning*, Joint Publication 5-0 (Washington DC: Joint Chiefs of Staff, 11 August 2011), GL-19. *Operational art* is defined as the cognitive approach by commanders and staffs—supported by their skill, knowledge, experience, creativity, and judgment—to develop strategies, campaigns, and operations and organize and employ military forces by integrating ends, ways, and means. *Operational approach* is defined as a description of the broad actions the force must take to reach the desired end state. It is the visualization of how the operation should transform current conditions into the desired conditions at end state.

problem, and develop the approach, which is supposed to produce in turn commander's planning guidance and commander's intent which is essentially the Commander's Appreciation and Campaign Design (CACD) methodology. This misapplication further complicated the true nature of design by poorly trying to apply a Clausewitizian concept into the world of Jominian thinking.

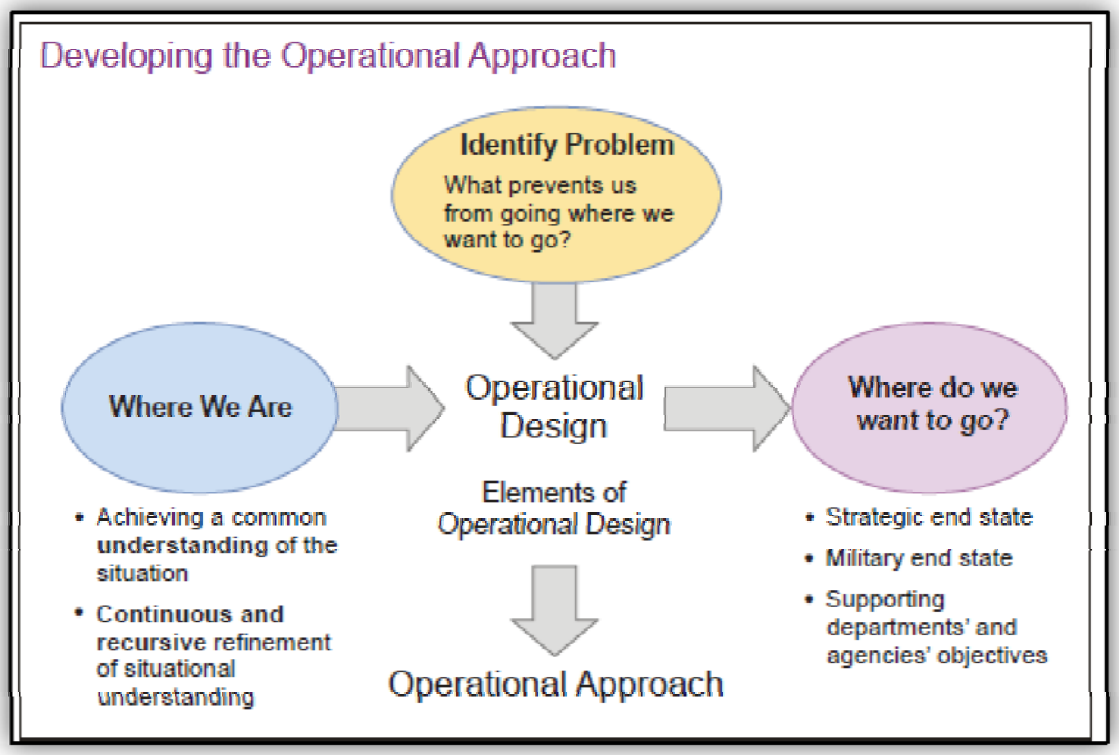



**Figure 17: Operational Approach (Joint).**

**Source: U.S. Joint Staff, *Joint Operation Planning*, Joint Publication 5-0 (Washington DC: Joint Chiefs of Staff, 11 August 2011), III-3.**

## How Design Got Off Track

Design was intended to be an important part to assist in taking a mission statement and end state and translating it into a comprehensive operational plan that clearly articulates overall purpose and direction.[39] Joint doctrine and Army doctrine differed in the application of the term design: joint doctrine referred to the process as operational design while the Army retained design. One of the places where design went off track was in its placement within the planning paradigm. The Army doctrine saw it as one of the three planning methodologies, while the joint doctrine saw it as a framework that underpins a campaign or major operation plan and its subsequent execution. Both saw design as an iterative process that only applied when faced with ill-structured problems further adding to confusion over where design fits into the planning process. Second, many of the products and intellectual explorations described in the design process were synonymous to mission analysis. The lack of a clear explanation of the linkages to the planning process additionally confused practitioners. The only link between mission analysis and COA development were described as effects and measures of effectiveness, but it is not clear how these efforts were focused. Planners can spend valuable time making lists of effects and objectives and never have any idea how they are to use these lists. Doctrine writers failed to address the fifth and sixth precepts of the school of design: a planning development structure must follow and that should emerge from the process fully formulated, explicit, and articulated.

Design brings clarity, defines critical challenges, and builds an analytical bridge between the problem and action. Joint doctrine simply states that the vaguely defined operational approach is based on the understanding of the strategic direction, understanding the operational environment, and understanding the problem, and becomes the basis for further detailed planning

[39] Keith D. Dickson, *Operational Design: A Methodology for Planners*, Student text Joint Advanced Warfighting School (Norfolk, VA, 15 February 2012), 1.

using the JOPP. Understanding the problem and environment is only a small part of design. Joint doctrine combined thirteen elements (terms) of what was previously known as operational art into elements of operational design. Terms are often applied interchangeably and buried in multiple processes. This violated the first and second precepts of design that it must be a controlled process of thought, developed deliberately and is formally learned. The product of design, a visualization or model is simple and complete. Doctrine writers also misapplied the third precept of design oversimplifying the leader of the organization to cooperatively lead the development of the shared vision to implying that this process is equivalent to developing commander's intent.

In summary, we have multiple interpretations of design with various definitions and precepts. The incongruence and dissection of what went wrong in the application of design into military doctrine can be distilled into four major points:

1. Lack of clarity of where design fits.
2. Confusion of design with commander's intent and guidance.
3. Mixing of design and mission analysis.
4. Profusion of terms to replace original design precepts.

## CHAPTER 5: GETTING DESIGN BACK ON TRACK

In the country of the blind, the one-eyed man is king.

Guderian

The initial step in getting design back on track is to properly define design. Design is a methodology for applying critical and creative thinking to further an understanding from a systems perspective of interdependent variables seeking an internal and external equilibrium to support decisions based on an assessment of capability and ability. The systems perspective recognizes the existence and the requirement to bring these variables into optimal equilibrium. Design requires a controlled and conscious process of thought expressed through an informal model that, when fully formulated, is explicit and articulated. As summarized by one observer, "design is a process of organizing and representing imperfect information and events with prior and new knowledge, applying concepts and experiences, then relating and linking them into a framework, using words and symbols to create a structure. "[1]

The first concept of getting design back on track is defining the relationship between design and its linkages in a hierarchical planning structure favored by military services. Design becomes the primary vehicle for determining strategic context and operational design the vehicle for applying operational art to the JOPP. Design exists in two distinct analytical bridges: one of design and the other of operational design. The design process "allows the commander and staff to gain a larger meaning and better understanding of the conditions explained in terms of a strategic context that influence a problem solution through a common perspective and a shared understanding….it supports commander's guidance to focus effort and bounds the problem that

[1] Keith D. Dickson, *How to Approach Design,* Student text Joint Advanced Warfighting School (Norfolk, VA, 15 February 2012), 1.

the JOPP is to address."[2] Operational design is a separate and sequential process of understanding and problem framing that supports commanders and staffs in their application of operational art (returning the term to its original meaning) with tools and a methodology to conceive and construct viable approaches to operations and campaigns. The second concept of getting design back on track is defining where and how design fits in the JOPP and that design no longer remains as a separate and distinct process. Therefore, design and operational design become two additional steps in the JOPP (figure 18).

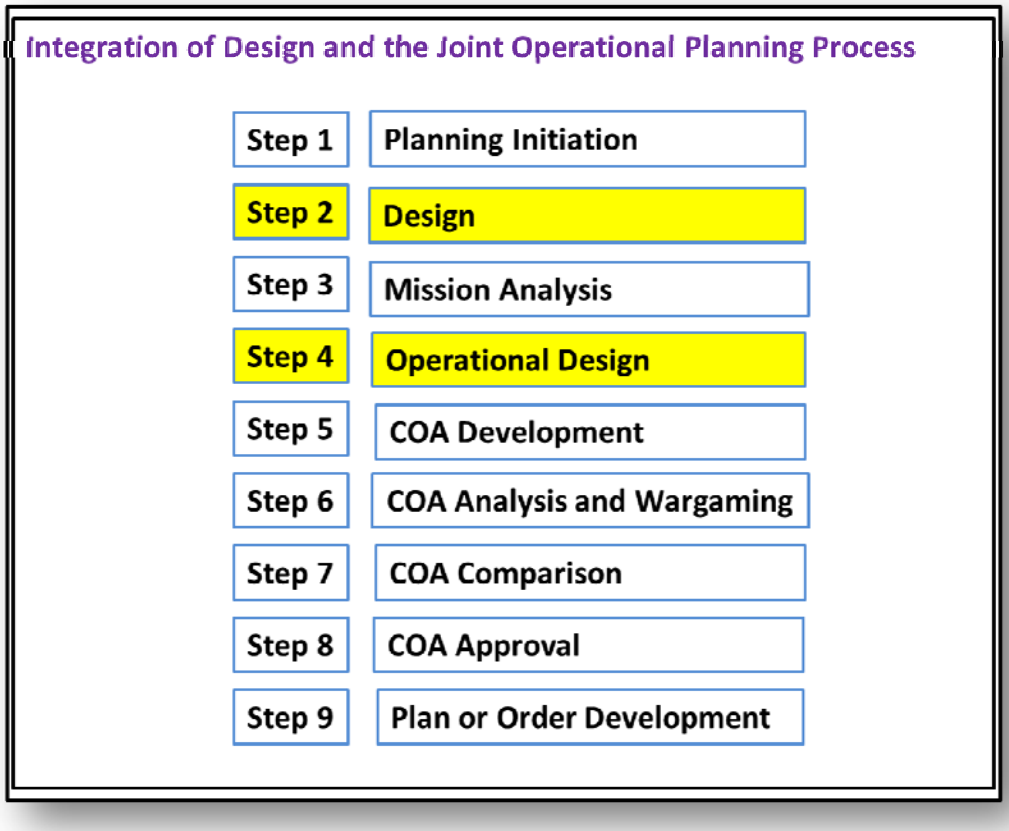



**Figure 18: Integration of Design and the JOPP Process.**

**Source: Created by author and suggested modification to figure IV-1 found in, Joint Staff, Joint Publication 5-0, *Joint Operation Planning* (Washington D.C.: U.S. Government Printing Office, 11 August 2011), IV-2.**

[2] Ibid, 1.

### *Design*

As defined by JP 5-0, design occurs after planning initiation. The purpose of the plan initiation step is to allow the staff and the commander to gather information and prepare for the design step. The process of design is outlined in the following steps and summarized in Figure 19:

1. Determine the strategic direction and context.
2. Understand the operational environment[3].
3. Define the problem.
4. Identify friendly and enemy centers of gravity at the strategic and operational level.
5. Define the termination criteria and military end state.
6. Define the objectives as conditions necessary to achieve the end state.
7. Define the effects that support the objectives.

[3] Military planners describe the operational environment in terms of operational variables. Operational variables are those broad aspects of the environment, both military and nonmilitary that are analyzed in eight interrelated variables: Political, Military, Economic, Social, Information, Infrastructure, Physical Environment, and Time (PMESII-PT).

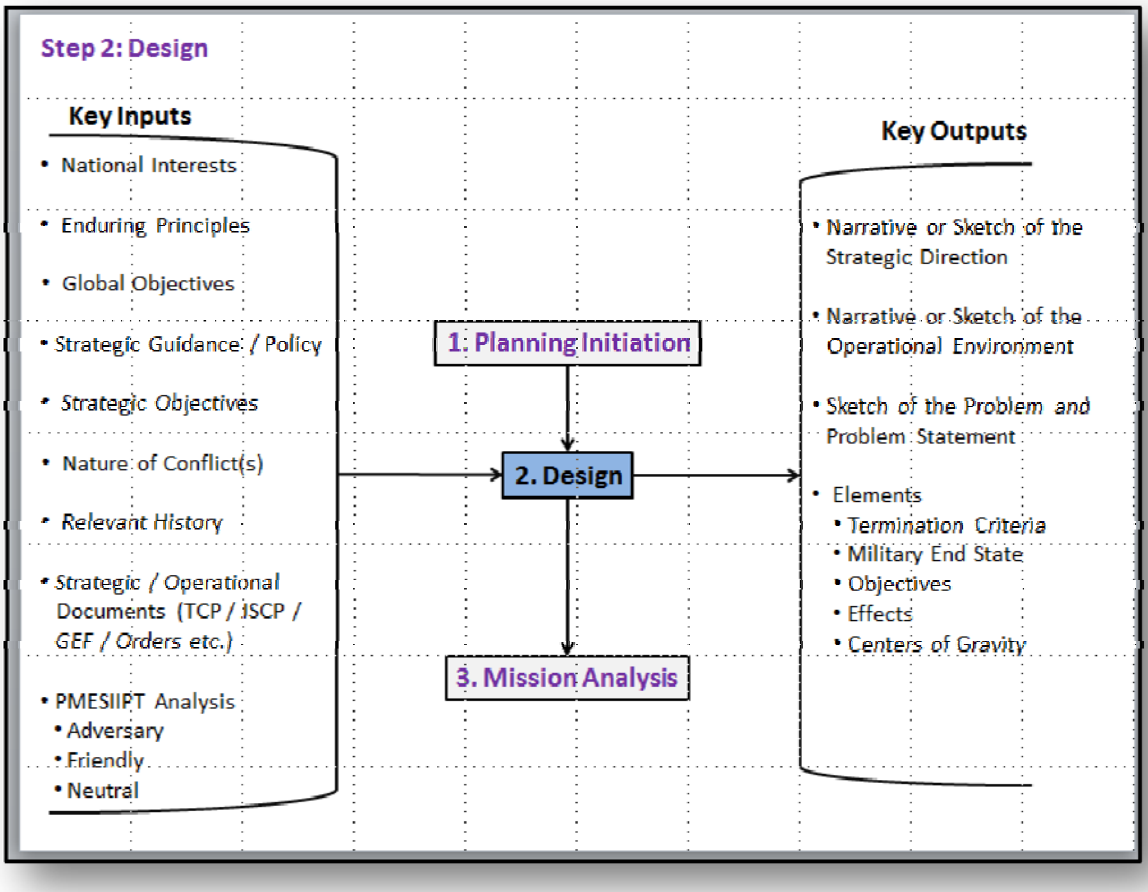



**Figure 19: Revised JOPP Step 2: Design.**

**Source: Created by author and suggested modification to, Joint Staff, Joint Publication 5-0, *Joint Operation Planning* (Washington D.C.: U.S. Government Printing Office, 11 August 2011).**

Step 1: Determine the strategic direction and context.

"Strategic guidance is often expressed by the President and the Secretary of Defense in an established set of strategic objectives."[4] Strategic guidance and direction is essential in understanding the purpose and focus for planning the employment of military force. Sources of strategic guidance comes in many forms including written documents, such as the GEF and JSCP, written directives, oral instructions, domestic and international laws, policies of other

[4] Joint Publication 5-0, III-7.

organizations that are interested in the situation, strategic communication guidance, and higher headquarters' orders or estimates.

Step 2: Understand the operational environment.

The key to complex systems management is the understanding of causal relationships, their linkages, their roots, and then classifying these relationships either as general behavior or rare occurrences. Understanding the links within a system, allows assessments to determine where the roots of certain deficiencies lie. This understanding allows the goals to be defined more adequately. "The operational environment is the composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander."[5] The commander and staff using a systems approach such as a Political, Military, Economic, Social, Information, Infrastructure, Physical Environment, and Time (PMESIIPT) analysis gain an understanding of the relevant and critical relationships between adversary, friendly, and neutral actors. As Senge explained, central to systems theory is an organizations ability to dialogue as a team to learn how to recognize patterns of interaction within a system and create mental models. Mental models, Senge's third discipline, are deeply ingrained assumptions, generalizations, or even pictures and image that influence how an individual understands and takes action.[6] This analysis can be expressed as a narrative or a sketch.

Step 3: Define the problem.

The problem statement and sketch identify root causes of tension, friction, or relationships and actions required to transform existing conditions toward the end state and back to equilibrium. An example of a problem statement and sketch is found in figure 20.

[5] Joint Publication 5-0, III-8.

[6] Senge, 8.

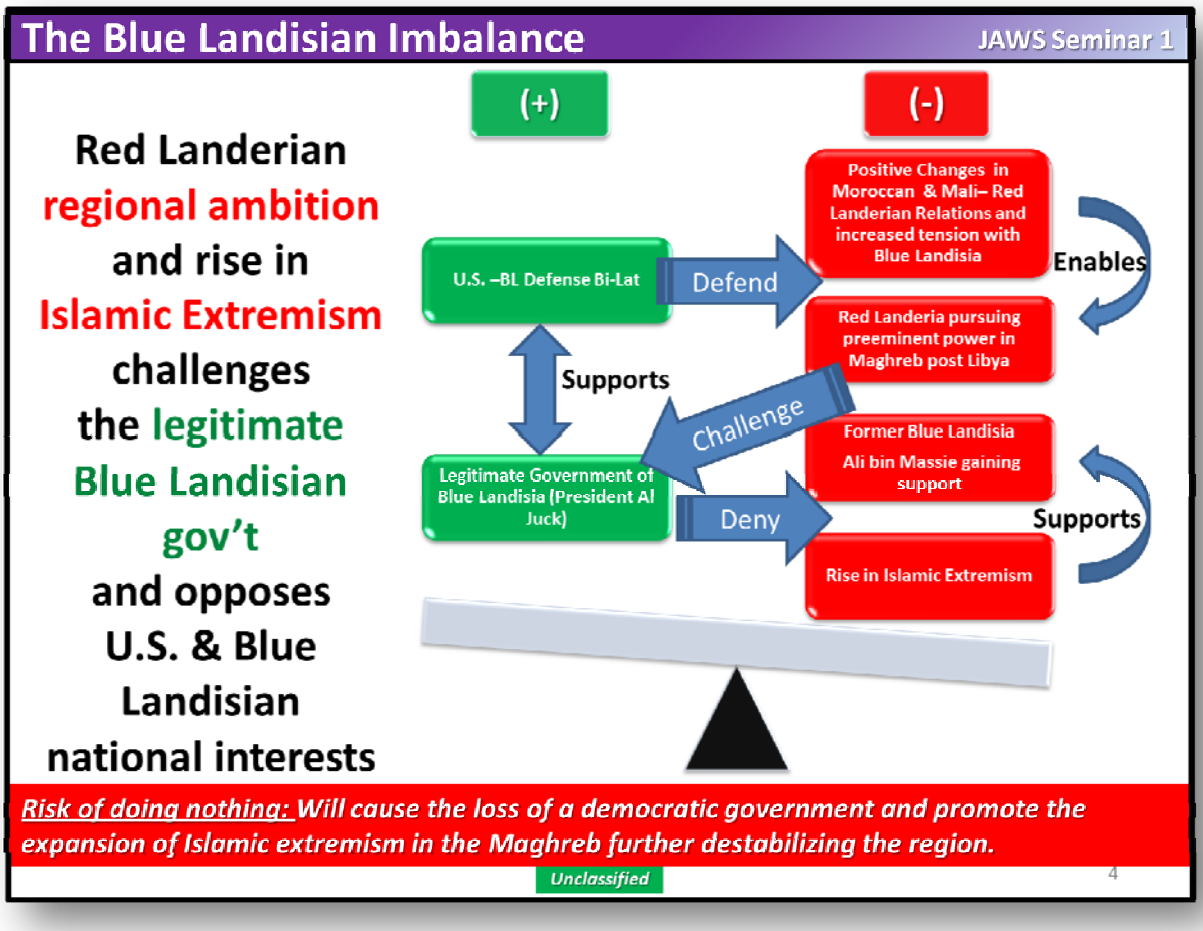



**Figure 20: Design Problem Statement and Sketch**

**Source: Created by JAWS Seminar 1 AY 11 during the design process for a fictitious scenario involving increased tensions between Red Landerian and Blue Landisian.**

Step 4: Identify friendly and enemy centers of gravity.

The center of gravity "is a source of power that provides moral or physical strength, freedom of action, or will to act."[7] An objective is always linked to a center of gravity (COG). There may also be different COGs at different levels, but they all should be nested. At the strategic level, a COG could be a military force, an alliance, political or military leaders, a set of critical functions,

[7] Joint Publication 5-0, III-22.

or national will. At the operational level, a COG often is associated with the adversary's military capabilities. Joint doctrine prescribes analyzing centers of gravity within a framework of three critical factors: critical capabilities, critical requirements, and critical vulnerabilities. A COG analysis sets the foundation on how a military force will exploit an adversary's critical vulnerability while protecting friendly critical capabilities and protecting friendly vulnerabilities from adversaries attempting to do the same.

Step 5: Define the termination criteria and military end state.

Termination criteria are first developed to enable determining the military end state. Termination criteria describe the conditions that must exist before conclusion of military operations. "The military end state represents a point in time and/or circumstances beyond which the President does not require the military instrument of national power as the primary means to achieve remaining national objectives."[8] The end state must be defined and matched to the strategic objectives and strategic end state. However as one observer has noted, "Planners should not necessarily wait for guidance for higher authorities to define the end state. The operational planner must have a strategic focus and an appreciation for the larger strategic goals defined in the national and theater level strategic documents and in the first step of design. By being able to articulate these goals, the planner assists in shaping and clarifying the end state."[9] As Mintzberg explained, the concept of design makes a clear distinction between thinking and the implementation of action. (See figure 21).

[8] Joint Publication 5-0, III-19.

[9] Dickson, Operational Design: A Methodology for Planners, 2.

Step 6: Define the objectives as conditions necessary to achieve the end state.

An objective is a clearly defined friendly goal toward which every military operation should be directed in achieving the military end state.[10] Objectives are not tasks rather expressed in clear and concise descriptive statements of what must be accomplished to reach the military end state. Objectives provide the basis for describing desired effects. (See figure 21).

Step 7: Define the effects that support the objectives.

Effects are an essential element in describing "a physical and/or behavioral state of a system that results from an action, a set of actions, or another effect."[11] For each objective, a list of effects is produced that describe the condition that supports achieving an associated objective. Effects are phrased as a complete thought expressed by the simple construct of a subject-verb-object and exist at two levels: effects related to objectives and effects related to decisive points in the operational design.[12] (See figure 21).

[10] Joint Staff, Joint Publication 5-0, III-20.

[11] Ibid, III-20.

[12] Dickson, Operational Design: A Methodology for Planners, 3.

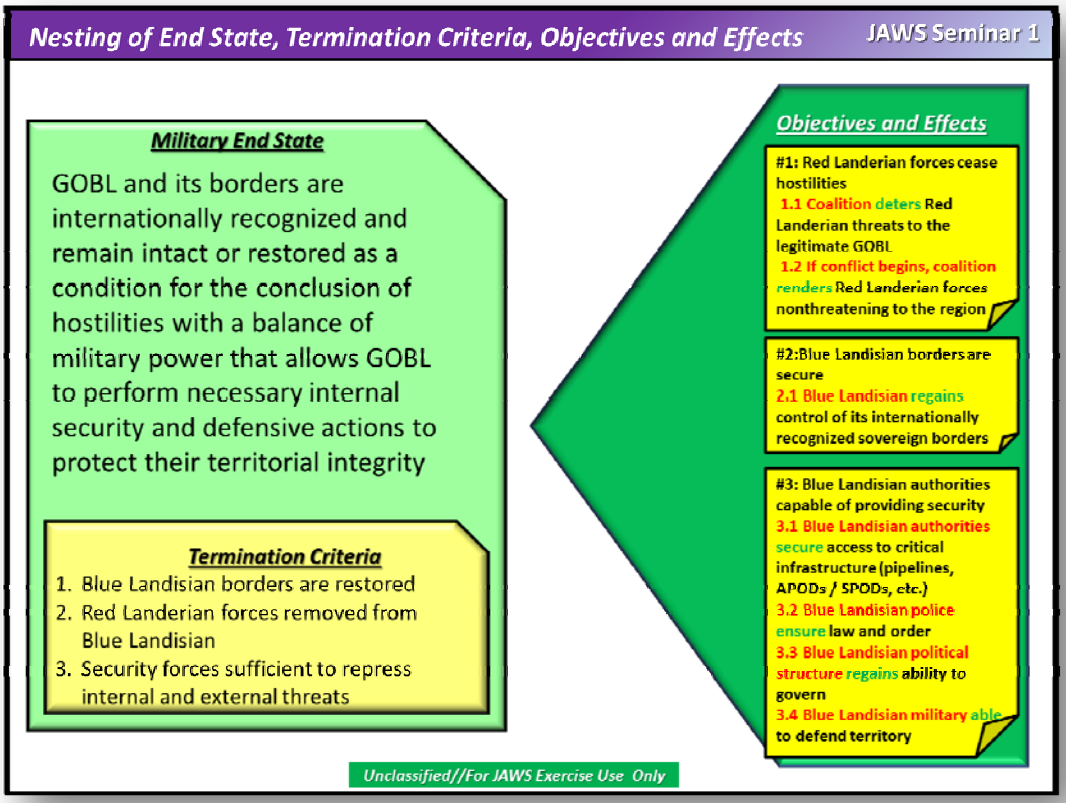



**Figure 21: Nesting of End State, Termination Criteria, Objectives, and Effects.**

**Source: Created by JAWS Seminar 1 AY 11 during the design process for a fictitious scenario involving increased tensions between Red Landerian and Blue Landisian.**

Once planners complete the design step, they begin mission analysis. "Mission analysis is used to study the assigned tasks and to identify all other tasks necessary to accomplish the mission."[13] Operational design begins after the mission analysis and applies the operational art as the means for the commander and staff to assist in visualizing the arrangement of operations to support the development of courses of action.[14]

[13] Joint Publication 5-0, IV-4.

[14] Dickson, Operational Design: A Methodology for Planners, 1.

### *Operational Design*

The purpose of operational design is to provide a framework for a more detailed and complete understanding of the overall execution of the campaign. It differs from Course of Action (COA) development as operational design uses a systems approach to identify nodes and links within the operational environment that serve as a focus of action and arranging operations. The process of operational design is outlined in the following steps and summarized in Figure 22:

1. Identify decisive points.
2. Identify lines of operation and lines of effort.
3. Arrange operations.

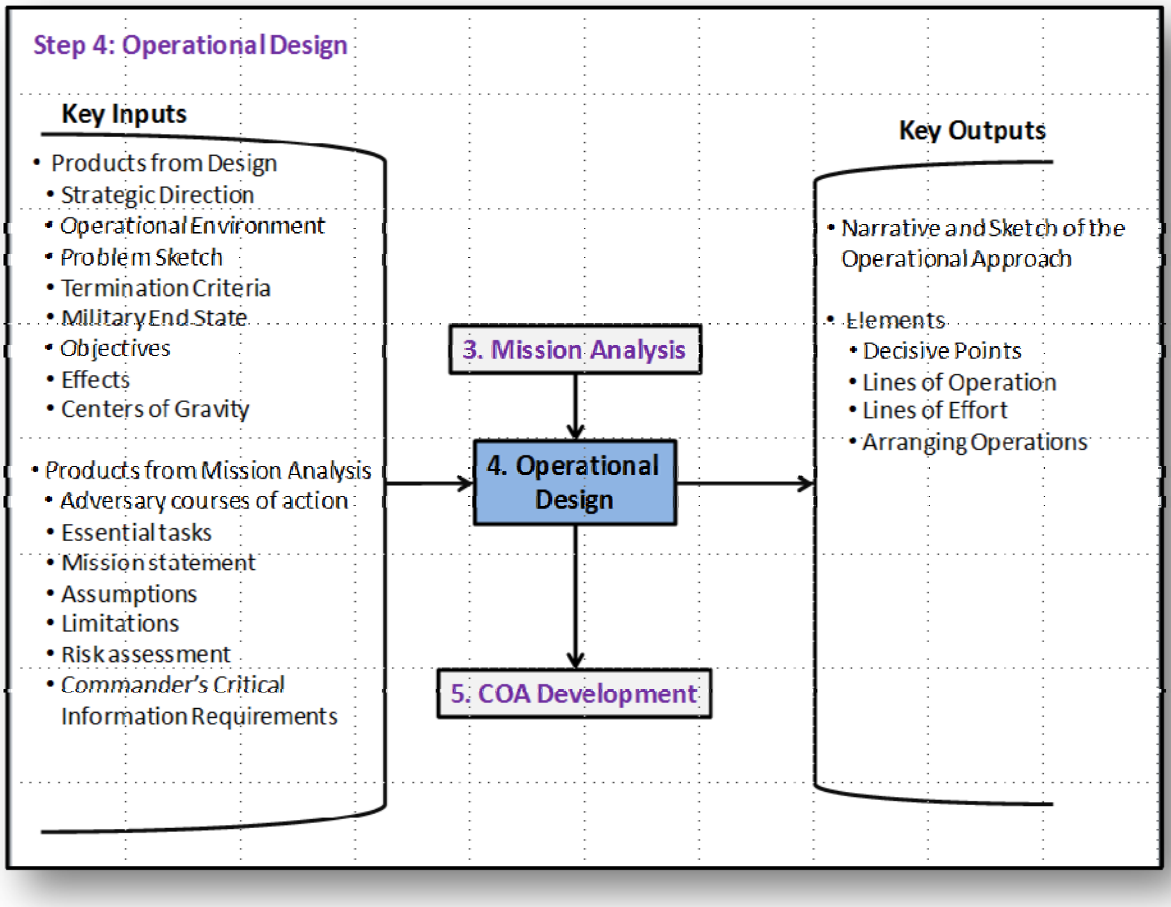



**Figure 22: Revised JOPP Step 4: Operational Design.**

**Source: Created by author and suggested modification to, Joint Staff, Joint Publication 5-0, *Joint Operation Planning* (Washington D.C.: U.S. Government Printing Office, 11 August 2011).**

Step 1: Identify decisive points.

A decisive point is a geographic place, specific key event, critical factor, or function that, when acted upon, allows a commander to gain a marked advantage over an adversary or contributes materially to achieving success (e.g., creating a desired effect, achieving an objective).[15] Decisive points can be physical in nature, such as a key or critical terrain feature; but they could include other elements such as command and control structures, critical boundaries, or airspace. In some cases, specific key events also may be decisive points, such as attainment of air or maritime superiority, commitment of the adversary's reserve, opening and maintaining lines of communication, or gaining or maintaining the trust of a critical leader. Decisive points may have a larger systemic impact and, when acted on, can substantially affect the adversary's systems or capabilities. Decisive points emerge from an analysis of the end state, objectives, and center(s) of gravity.[16] An initial approach in developing decisive points is done from an analysis of the critical center of gravity factors. Understanding the relationship between a COG's critical capabilities, requirements, and vulnerabilities can aide in the development of direct and indirect approaches to attacking adversary or protecting friendly centers of gravity. Decisive points are neither centers of gravity nor objectives, but can become so in certain phases when arranging operations. (See figure 27)

Step 2: Identify lines of operation and lines of effort.

Lines of operation and lines of effort express the orientation of the force that connects decisive points or decisive actions related in time and space to achieving an objective(s). Lines of operation and lines of effort are structurally the same, but differ in their application and

[15] Joint Publication 5-0, III-26.

[16] Dickson, Operational Design: A Methodology for Planners, 3.

placement along the continuum of operations. Lines of operation are designed for major combat operations, that when defeat mechanisms are applied, attack adversary or protect friendly centers of gravity; lines of operation are typically found in Phase I: Deter, Phase II: Seize the Initiative, and Phase III: Dominate within a six phasing model. In contrast, lines of effort are designed outside major combat operations affecting order to attain conditions that support establishing a lasting and stable peace (stability mechanisms); lines of effort are typically found in Phase 0: Shape, Phase IV: Stabilize, and Phase V: Enable Civil Authority within a six phasing model. Lines of operation and lines of effort should be broadly defined and are either logical or functional. Logical lines are descriptive and collective in nature and refer to conditions. Functional lines relate to orientation of the joint force along functions or functional components. (See figure 23).

Step 3: Arrange operations.

Having determined in order, end state, objectives and effects, centers of gravity, decisive points, and lines of operation, planners then can link lines of operation to decisive points and examine how and where certain decisive points support multiple lines of operation or transition to lines of effort.[17] Phasing is a way to view and conduct a complex joint operation in manageable parts and integrate, sequence, and synchronize related actions and decisive points in time and space. Phases can be concurrent, but a clearly defined transition between the phases related to the sequencing of decisive points eliminates any ambiguity. Phase 0: Shape in the six phasing model construct is neither represented in figure 23 nor in operational design as it relates peacetime military activities directly related to the Theater Campaign Plan and not the commitment to the use of military force. The most critical component to phasing an operation is determining when

[17] Dickson, Operational Design: A Methodology for Planners, 6.

one phase ends and the next phase begins. These transitions are decisive in nature as it reflects a change in orientation of the force. The most decisive transition is between Phase III: Dominate and Phase IV: Stabilize. The key factor in understanding when the transition from Phase III to Phase IV begins is when the adversary's operational center of gravity no longer directly influences military operations. Once defeated, the scope, scale, and purpose of all actions related to attacking the adversary's center of gravity shift immediately into lines of effort and stability mechanisms. Some objectives, effects, and decisive points used within the lines of operation may carry over during this transition to lines of effort and achieving the desired end state.

Once the operational design is completed, the commander is presented with the operational approach (mental model) to provide guidance in order to develop courses of action. Joint doctrine defines operational approach as "a description of the broad actions the force must take to reach the desired end state. It is the visualization of how the operation should transform current conditions into the desired conditions at end state."[18] As Senge stated, mental models, are pictures and image that influence how an individual understands and takes action. This leads to a shared vision that unites the organization to a commonly understood goal. The most direct way to develop a shared vision is to evolve a leader's personal vision. People in the organization commit to the leader's personal vision through personal mastery; the visual image evolves and becomes more recognizable until everyone shares it. (See figure 24 for an example of an operational approach).

[18] Joint Publication 5-0, GL-19.

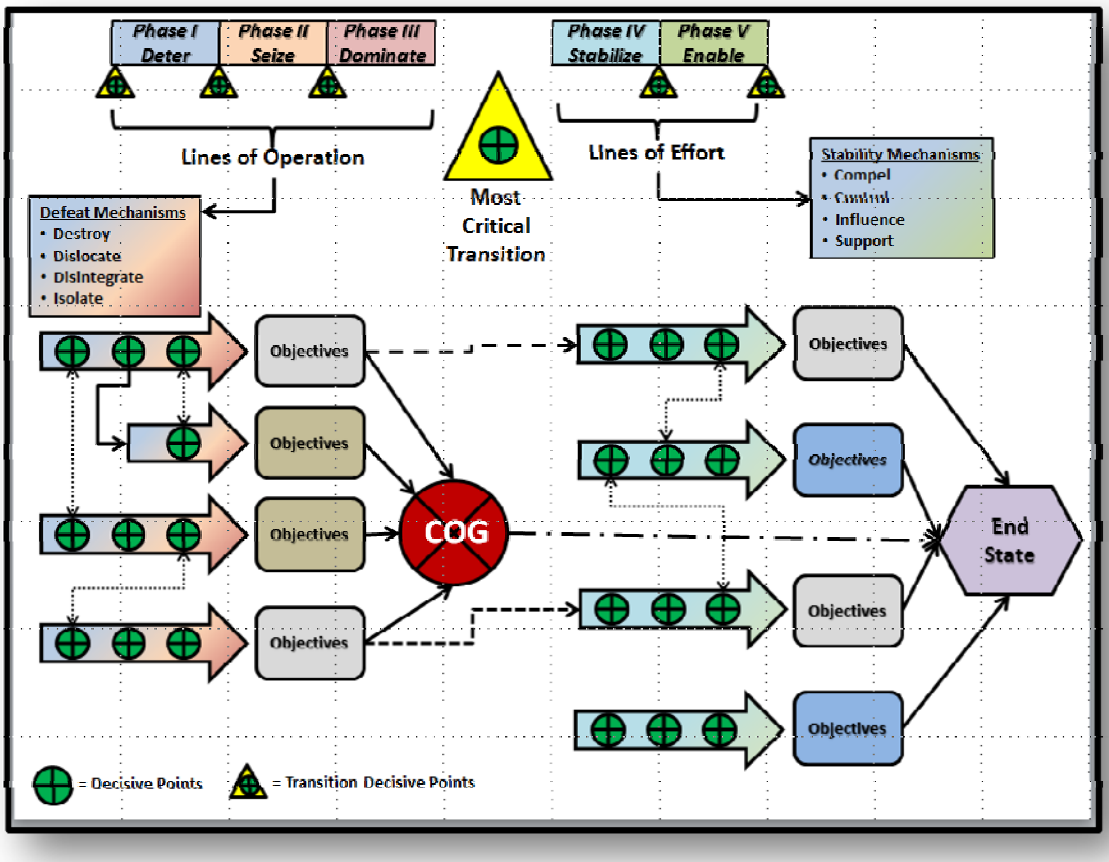



**Figure 23: Operational Design Sketch.**

**Source: Created by author, adapted from Keith D. Dickson, *Operational Design: A Methodology for Planners*, Student text Joint Advanced Warfighting School (Norfolk, VA, 15 February 2012), 8-14.**

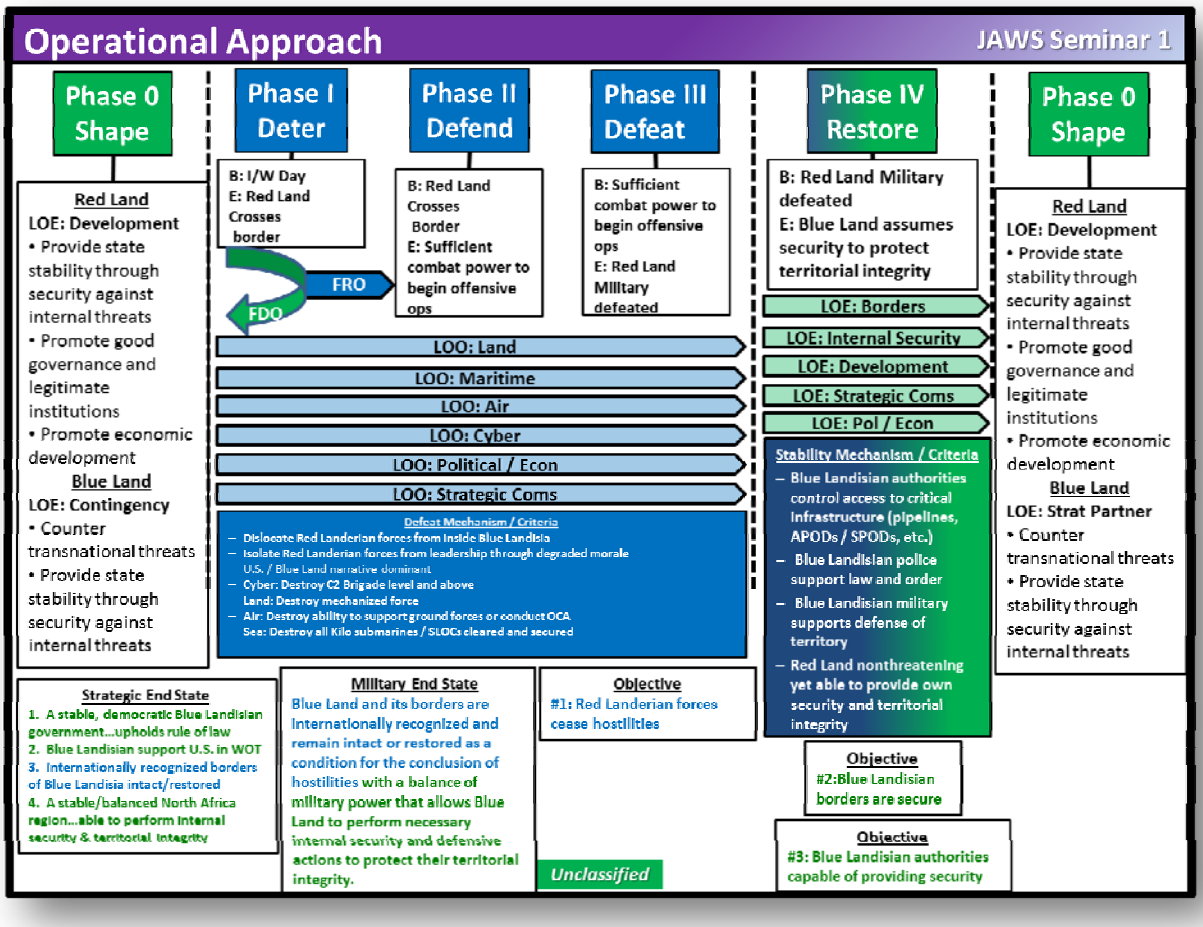



**Figure 24: Operational Approach.**

**Source: Created by JAWS Seminar 1 AY 11 during the design process for a fictitious scenario involving increased tensions between Red Landerian and Blue Landisian.**

### *Elements of Design*

The final step in getting design back on track is articulating where the thirteen elements clearly reside. Figure 25 provides a tabular depiction of where the thirteen elements reside. The five elements of: direct and indirect approach, anticipation, operational reach, culmination, and forces and functions do not directly add value, but indirectly their concepts remain valid for consideration throughout the JOPP and in the application of operational art; to the skill and insights of the commander to apply.

| Joint Publication 5-0: Joint Operation Planning Elements of Design | | |
|---|---|---|
| **Step 2: Design** | **Step 4: Operational Design** | **Operational Art** |
| Termination | Decisive points | Direct and indirect approach |
| Military end state | Lines of operation and effort | Anticipation |
| Objectives | Arranging Operations | Operational reach |
| Effects | | Culmination |
| Centers of gravity | | Forces and Functions |

**Figure 25: Redistribution of Joint Operation Planning Elements of Design.**

**Source: Created by author to illustrate the redistribution of the thirteen elements of design as found in Joint Staff, Joint Publication 5-0, *Joint Operation Planning* (Washington D.C.: U.S. Government Printing Office, 11 August 2011), III-18 to III-38.**

# CHAPTER 6: CONCLUSION

Just as in the national strategic calculus, the business model seeks to understand the environment and apply resources in the proper mix to achieve the best outcomes. Design is a natural companion to the development of strategy, and to operational art, because it is a thinking construct that provides direction and understanding prior to implementation and application; it brings clarity, defines the critical challenges, and builds an analytical bridge between the problem and action. Henry Mintzberg summarized the school of design premises in the following list of characteristics:[1]

1. Controlled and conscious process of thought.
2. Simple and informal models.
3. One strategist.
4. Unique.
5. Emerge fully formulated, explicit, and articulated.
6. Structure follows strategy.

Design is a methodology for applying critical and creative thinking to further an understanding from a systems perspective of interdependent variables seeking an internal and external equilibrium to support decisions based on an assessment of capability and ability. The terms, concepts, and intellectual accessories presented by Kenneth Andrews, Henry Mintzberg, Ludwig von Bertalanffy, Thomas Kuhn, Horst Rittel, Melvin Webber, Dietrich Dörner, and Peter Senge summarized below cement a deeper appreciation and understanding of design as a methodology for applying critical and creative thinking to construct a framework in developing a systems approach to solve problems.

[1] Henry Mintzberg, "The Design School: Reconsidering the Basic Premises of Strategic Management", *Strategic Management Journal, Vol. 11, No. 3* (UK: John Wiley & Sons, 1990), 177-179.

| Intellectual Components of Design |
| --- |
| **4. Requires an understanding of complex problems as non-linear systems. Observation, analysis of relationships, extrapolation of data, and the formation of a model, theory, or paradigm.** |
| **5. A critical and creative thinking process. Understanding situations, finding causes, arriving at justifiable conclusions, making good judgments, and learning from experience to solve problems. Using adaptive approaches, drawing from previous similar circumstances, or applying innovative approaches, to develop a completely new idea.** |
| **6. Learning organizations act as complex problem solvers. Personal mastery, mental models, shared vision, and team building.** |

The initial step in getting design back on track is to properly define design as a methodology for applying critical and creative thinking to further an understanding from a systems perspective of interdependent variables seeking an internal and external equilibrium to support decisions based on an assessment of capability and ability. The first concept of getting design back on track is defining the relationship between design and its linkages in a hierarchical planning structure favored by military services.

Design becomes the primary vehicle for determining strategic context and operational design the vehicle for applying operational art to the JOPP. Design exists in two distinct analytical bridges: one of design and the other of operational design. The design process "allows the commander and staff to gain a larger meaning and better understanding of the conditions explained in terms of a strategic context that influence a problem solution through a common perspective and a shared understanding….it supports commander's guidance to focus effort and bounds the problem that the JOPP is to address."[2]

Operational design is a separate and sequential process of understanding and problem framing that supports commanders and staffs in their application of operational art (returning the term to its original meaning) with tools and a methodology to conceive and construct viable

[2] Dickson, How to Approach Design, 1.

approaches to operations and campaigns. The second concept of getting design back on track is defining where and how design fits in the JOPP and that design no longer remains as a separate and distinct process. Therefore, design and operational design become two additional steps in the JOPP (figure 26).

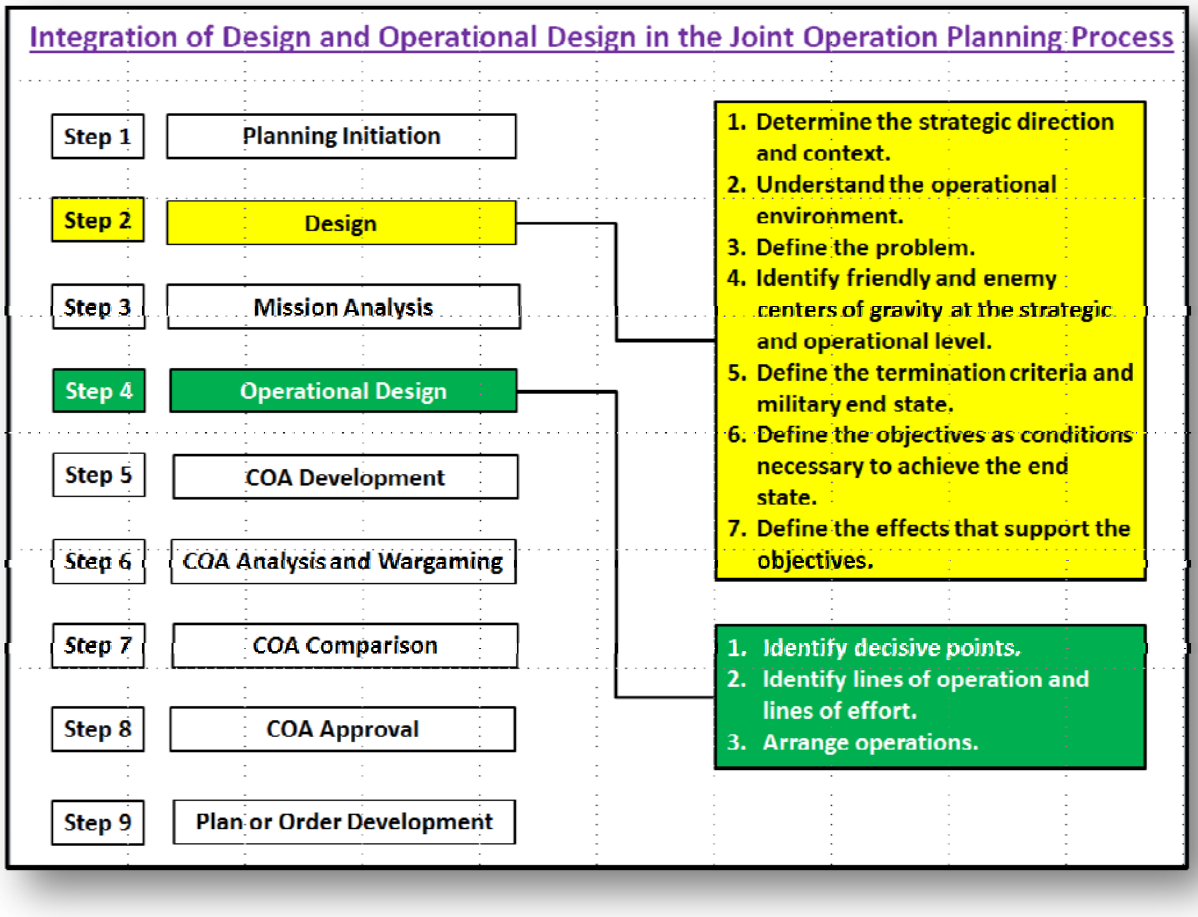



**Figure 26: Integration of Design and Operational Design into JOPP.**

**Source: Created by author to summarize Chapter 5: Getting Design Back on Track.**

## BIBLIOGRAPHY


Ackoff, Russell L. *The Art of Problem Solving*. Pennsylvania: John Wiley & Sons, 1978.

Andrews, Kenneth R. *The Concept of Corporate Strategy*. IL: Homewood, 1971.

Bertalanffy, Ludwig von. *General Systems Theory: Foundations, Development, Application.* Rev. ed. New York: George Braziller, 1993.

Bloom Benjamin. *Taxonomy of Educational Objectives: The Classification of Educational Goals; Handbook I: Cognitive Domain.* New York: Longman, 1956.

Christensen, C.R., K.R. Andrews, J.L. Bower, G. Hammermesh, M.E. Porter. *Business Policy: Text and Cases*, 5th Edition. IL: Irwin, 1982.

Clausewitz, Carl Von. *On War*. Princeton: Princeton University Press, 1984.

Conklin, Jeff. *Dialogue Mapping: Building Shared Understanding of Wicked Problems*. England: John Wiley & Sons, LTD, 2006.

Davison, Ketti, "From Tactical Planning to Operational Design," *Military Review*, September-October 2008.

_____."Systemic Operational Design (SOD): Gaining and Maintaining the Cognitive Initiative." Monograph School of Advanced Military Studies, United States Army Command and General Staff College. (Fort Leavenworth, KA: 25 May 2006.

Dickson, Keith D. *How to Approach Design*, Student text Joint Advanced Warfighting School. Norfolk, VA, 15 February 2012.

_____. *Operational Design: A Methodology for Planners*, Student text Joint Advanced Warfighting School. Norfolk, VA, 15 February 2012.

Dörner Dietrich. *The Logic of Failure*. New York: Metropolitan Books, 1996.

Fauconnier Gilles and Mark Turner, *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities.* New York: Basic Books, 2002.

Foster, Gregory D. "A Conceptual Foundation for a Theory of Strategy". *The Washington Quarterly*, Winter, 1990.

Gordon Michael R. and Bernard F. Trainor. *Cobra II: The Inside story of the Invasion and Occupation of Iraq*. NY: Pantheon Books, 2006.

Hayes, Robert H. "Strategic Planning – Forward in Reverse?". *Harvard Business Review, November-December 1985.* Boston: Harvard Business School, 1985.

Hobbes, Tim. *The Anatomy of Problem Solving*. Colorado Springs, CO: Book Surge LLC, 2007.

Johnson. David E., Peter A. Wilson, Richard E. Darilek, Laurinda L. Zeman, *Joint Paths to the Future Force: A Report on Unified Quest 2004.* CA: Rand Corporation, 2006.

Kompridis, Nikolas. "So We Need Something Else For Reason to Mean". *International Journal of Philosophical Studies, Volume 8, Issue 3*. London: Taylor & Francis, December 2000.

Kuhn, Thomas S. *The Structure of Scientific Revolutions*. 3rd ed. Chicago: University of Chicago Press, 1996.

Lauder Matthew. "Systemic Operational Design: Freeing Operational Planning From the Shackles of Linearity", *Canadian Military Journal,* Volume 9, No.4, 2009.

Leidtka, Jeanne M. "Strategy Formulation: The Roles of Conversation and Design". *The Blackwell Handbook of Strategic Management*. UK: Blackwell Publishing, 2005.

Mattis, James N. "USJFCOM Commander's Guidance for Effects based Operations," *Parameters,* Autumn 2008.

_____."Memorandum for USJFCOM, Subject: Vision for a Joint Approach to Operational Design", 06 October 2009.

Menning, Bruce W. "Operational Art's Origins." *Military Review*. September-October 1997.

Mintzberg, Mintzberg. "The Design School: Reconsidering the Basic Premises of Strategic Management". *Strategic Management Journal, Vol. 11, No. 3*. UK: John Wiley & Sons, 1990.

_____. *Strategy Safari: The Guided Tour Through The Wilds of Strategic Management*. New York: Free Press, 1998.

_____. *The Rise and Fall of Strategic Planning*. New York: Simon & Shuster, 1994.

Naveh, Shimon. *In Pursuit of Military Excellence: The Evolution of Operational Theory*. London: Frank Cass, 1997.

Rittel, Horst and Melvin Webber. "Dilemmas in a General Theory of Planning". *Policy Sciences 4.* Amsterdam: Elsevier Scientific Publishing Company, 1973.

Rumelt, Richard P. *Good Strategy Bad Strategy: The Difference and Why it Matters*. New York: Crown Business, 2011.

Senge Peter. *The Fifth Discipline: The Art & Practice of The Learning Organization*. NY: Doubleday, 1990.

Schneider, James R. *Theoretical Paper No. Four. Vulcan's Anvil: The American Civil War and the Foundation of Operational Art.* Fort Leavenworth: United States Army Command and General Staff College, 10 May 2004.

U.S. Army. *Army Leadership, Field Manual 22-100*. Washington DC: Department of the Army, 31 August, 1999.

U.S. Army, *Counterinsurgency,* Field Manuel 3-24. Washington DC: Department of the Army, 15 December 2006.

U.S. Army. *Art of Design Student Text, Version 2.0*. Kansas: School of Advanced Military Studies, May 2010).

U.S. Army. *The Operations Process,* Field Manuel 5-0. Washington DC: Department of the Army, 18 March 2011.

U.S. Army. *Commander's Appreciation and Campaign Design Version 1.0,* TRADOC Pamphlet 525-5-500. Virginia: TRADOC, 28 January 2008.

U.S. Army War College. *Guide to National Security Issues Volume I: Theory of War and Strategy 4th Edition*. Pennsylvania: Strategic Studies Institute, July 2010.

U.S. Army War College. *Guide to Strategy*. Pennsylvania: Strategic Studies Institute, February 2001.

U.S. Army War College. *Guide to National Security Issues Volume II: National Security Policy and Strategy*. Pennsylvania: Strategic Studies Institute, July 2010.

U.S. Joint Staff. *Joint Operation Planning,* Joint Publication 5-0. Washington DC: Joint Chiefs of Staff, 11 August 2011.

U.S. Joint Staff. *Joint Operations,* Joint Publication 3-0. Washington DC: Joint Chiefs of Staff, 11 August 2011.

U.S. Joint Staff. *Capstone Concept for Joint Operations 2.0*. Washington DC: Joint Chiefs of Staff, August 2005.

U.S. Joint Staff, Joint Doctrine Series Pamphlet 10 *Design in Military Operations: A Primer for Joint Warfighters.* September 2010.

U.S. Joint Forces Command. *Commander's Handbook for Operational Design Final Draft,* The Joint Warfighting Center. Virginia: JFCOM, 27 June 2011.

U.S. Joint Forces Command. *Design in Military Operations A Primer for Joint Warfighters,* The Joint Warfighting Center Joint Doctrine Series Pamphlet 10. Virginia: JFCOM, 20 September 2010.

U.S. Marine Corps. *MCWP 5-1: The Marine Corps Planning Process*. August 2010.

Yarger, Harry R. "*Toward a Theory of Strategy: Art Lykke and the U.S. Army War College Strategy Model*" The U.S. Army War College Guide to National Security Issues: Volume 1: Theory of War and Strategy. Pennsylvania: Strategic Studies Institute, July 2010.

_____. "*Strategic Theory for the 21st Century: The Little Book on Big Strategy*." Carlisle, PA: Strategic Studies Institute, 2006.

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